1242, 1250, 1260 Gordon Street and 9 Valley Road, Guelph, ON – Environmental Impact Study

Final Report

May 22, 2020
File: 161413684

Prepared for:

Tricar Developments Inc.
3800 Colonel Talbot Rd.
London, ON N6P 1H5

Prepared by:

Stantec Consulting Ltd.
70 Southgate Dr. Suite 1
Guelph, ON N1G 4P5

This document entitled 1242, 1250, 1260 Gordon Street and 9 Valley Road, Guelph, ON – Environmental Impact Study was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Tricar Developments Inc. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Melissa Straus
(signature)

Melissa Straus, M.Sc.
Terrestrial Ecologist

Prepared by Kimberly Zupfer
(signature)

Kimberly Zupfer, M.Sc.
Ecologist

Reviewed by Daniel Eusebi
(signature)

Daniel Eusebi, BES, MCIP, RPP
Senior Environmental Planner

Table of Contents

List of Tables

LIST OF APPENDICES

Abbreviations

AMO	Atlas of the Mammals of Ontario
ANSI	Area of Natural Significance
BSC	Bird Studies Canada
CC	Coefficient of Conservatism
cm	Centimeter
COSSARO	Committee on the Status of Species at Risk in Ontario
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DBH	Diameter at Breast Height
EAC	Environmental Advisory Committee
ECCC	Environment and Climate Change Canada
EIR	Environmental Implementation Report
EIS	Environmental Impact Study
ELC	Ecological Land Classification
END	Endangered
END-NS	Endangered – No Schedule
ESA	Endangered Species Act
FSR	Functional Servicing Report
GRCA	Grand River Conservation Authority
ha	Hectare
LIO	Land Information Ontario
m	Meter

MBCA	Migratory Bird Convention Act
mm	Millimeter
NHIC	Natural Heritage Information System
NRSI	Natural Resource Solutions Inc.
OBBA	Ontario Breeding Bird Atlas
OP	Official Plan
ORAA	Ontario Reptiles and Amphibians Atlas
OWES	Ontario Wetland Evaluation System
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
SAR	Species at Risk
SARO	Species at Risk in Ontario
SC	Special Concern
SWH	Significant Wildlife Habitat
SWM	Stormwater Management
THR	Threatened
ToR	Terms of Reference

1.0 INTRODUCTION

The Subject Property is approximately 2.8 hectares (ha) in size and is comprised of four properties located at 1242,1250 and 1260 Gordon Street and 9 Valley Road in the City of Guelph, Ontario (**Figure 1**, **Appendix A**). The residence at 9 Valley Road is vacant and 1260 Gordon Street has been demolished in accordance with a demolition permit whereas 1242 and 1250 are currently occupied single-dwelling homes.

Surrounding the Subject Property is a 120-meter (m) Study Area boundary, as shown on **Figure 1** (**Appendix A**), which is comprised of single-family residential lots to the northeast and newly constructed apartments to the east and west. Forest and wetland features associated with the Torrance Creek Swamp Provincially Significant Wetland (PSW) borders the Subject Property at the northeast with the Hanlon Creek PSW located west of Gordon Street.

Stantec Consulting Ltd. was retained by Tricar Developments Inc. (Tricar) to complete an Environmental Impact Study (EIS) in support of a Zoning By-Law Amendment as well as future site plan application and Plan of Condominium for the proposed development of the Subject Property. Tricar is planning two 12 storey apartment buildings with surface and below grade parking.

This EIS is based on the approved Terms of Reference (ToR) and will present results of the 2018 and 2019 field program and include an analysis of concordance of the proposed development with existing provincial and municipal policy. The purpose of the EIS is to characterize the significance and sensitivity of existing natural features in the Study Area, identify potential impacts of the project on these natural features, and recommend appropriate measures to avoid or minimize potential negative impacts.

This EIS report was prepared in accordance with applicable policies and regulations described in **Section 2.0.**

1.1 AGENCY CONSULTATION

A pre-consultation meeting that included City of Guelph, Tricar and Stantec staff was held on June 13, 2018 to discuss the proposed zone change required to accommodate the development of the Subject Property. This meeting determined that an EIS was required due to the designation of a portion of the Subject Property as Significant Natural Area. Among other items, the meeting determined the requirement for a Tree Preservation Plan (TPP), Stormwater Management Report/Functional Servicing Report (FSR), Geotechnical Report, and Hydrology Report, which are included as part of this EIS. The pre-consultation meeting summary is provided in **Appendix B1.**

A ToR for this EIS was previously submitted to the City July 23, 2018 (dated July 19, 2018) and was heard at the City's Environmental Advisory Committee (EAC) on September 12, 2018. EAC supported the ToR with a list of conditions, with the addition of specifics elements required for inclusion in the hydrogeological study. A second set of comments were provided on October 17, 2018 which included a consolidated list of Environmental Planning, Parks, and Grand River Conservation Authority (GRCA) comments. City, GRCA, and EAC comments were incorporated into a second version of the ToR, dated January 21, 2019 which was approved on February 27, 2019. The approved ToR and associated correspondence is provided in **Appendix C**.

A natural heritage information request was submitted to the Ministry of Natural Resources and Forestry (MNRF) Guelph District, with a response received on July 12, 2018. MNRF consultation is provided in **Appendix B2.**

2.0 POLICY CONSIDERATIONS

An assessment of the natural heritage features and functions within the study area was undertaken to comply with the requirements of the following policy and guidance documents:

2.1 PROVINCIAL POLICY STATEMENT

The Provincial Policy Statement (PPS) was issued by the Ontario Ministry of Municipal Affairs and Housing (OMAH) under Section 3 of the *Planning Act* and came into effect on May 22, 1996. It was revised in 2005, 2014 and most recently in 2020. Decisions made by Planning Authorities shall be consistent with the policy statements issued under the *Planning Act*, such as the PPS, which includes policies on development and land use patterns, resources and public health and safety. Section 2.1 of the PPS deals with Natural Heritage and requires natural heritage systems to be identified in various Ecoregions including Ecoregion 6E, which includes the Study Area.

According to Section 2.1.4 of the PPS, development and site alteration shall not be permitted in the following features in Ecoregion 6E:

a) significant wetlands; or,

b) significant coastal wetlands.

According to Section 2.1.5 of the PPS, development and site alteration shall not be permitted in the following features, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions:

a) Significant Woodlands

b) Significant Valleylands

c) Significant Wildlife Habitat

d) Significant Areas of Natural and Scientific Interest

e) coastal wetlands that are not subject to policy 2.1.4(b).

Development and site alteration shall not be permitted in the following features, except in accordance with provincial and federal requirements:

a) significant portions of the habitat of endangered or threatened species

b) fish habitat.

2.2 CITY OF GUELPH

2.2.1 Official Plan

The *City of Guelph Official Plan* (OP) (Consolidated March 2018) recognizes natural heritage features as part of a Natural Heritage System, including natural areas, significant natural areas and wildlife crossings that are important to the City's environmental, social, cultural and economic values. The purpose of the Natural Heritage System is to identify and protect important natural heritage features, and to maintain, restore and where possible, improve the ecological function, biodiversity and connectivity of these features while providing for limited compatible development. Any development within or adjacent to natural areas or significant natural areas and their components (General Policies 4.1.1) requires the submission of an EIS to the City of Guelph in support of the development application.

The Natural Heritage System includes Significant Natural Areas for long-term permanent protection including:

- Significant Areas of Natural and Scientific Interest (ANSI)
- Significant Habitat for Provincially Endangered and Threatened Species
- Significant Wetlands
- Surface Water Features and Fish Habitat
- Significant Woodlands
- Significant Valleylands
- Significant Landform
- Significant Wildlife Habitat (SWH; including Ecological Linkages)
- Restoration Areas
- Minimum or Established buffers (where applicable)

Natural Areas where development may be permitted provided an EIS can demonstrate that there will be no negative impacts to the natural heritage features or their ecological function. These Natural Areas include:

- other wetlands
- cultural woodlands
- habitat of significant species
- established buffers (where applicable)

The minimum buffers apply within the adjacent lands and are identified to prevent damage and degradation to the identified Natural Heritage features and are part of the Natural Heritage System. The minimum buffer to a PSW is 30m, 10m from the dripline of significant woodlands and 15m from a locally significant wetland boundary.

The Natural Heritage System also incorporates hazard lands including steep slopes, erosion hazard lands and unstable soils that are under the jurisdiction of the GRCA, as discussed in **Section 2.3**.

2.2.2 Zoning By-law

The purpose of the City's Zoning By-law (1995 – 14864) is to regulate the use of land, which prescribes what type and where buildings, dwellings, and structures may be located, as well as standards for parking, building height, yards, and lot sizes.

The Subject Property is currently zoned R.1B (single detached residential) with shading to illustrate PSW-adjacent lands and containing one of the following: Significant Woodlands, Locally Significant Wetlands, Natural Corridor or Linkage. A zoning by-law amendment is being sought to change the R.1B zoning to Residential Apartment (R.4B), with site specific provisions that permit a density increase up to a maximum of 215 units per ha, a reduction in exterior and interior side yards to 3.6 m and 17.6 m respectively, and a reduction in underground parking setback, as well as an increase in height up to a maximum of 12 storeys, an increased Floor Space Index, and a reduction in visitor parking requirements.

2.2.3 Tree By-law

The City of Guelph's Tree By-law was created to prevent damage or destruction to trees on private property. Some trees are exempt from the by-law (e.g., hazard trees or those impacted by natural events). A permit is required to remove any tree on a lot larger than 0.2 ha if it is greater than 10 centimeters (cm) in diameter at 1.4 m above the ground and not otherwise exempt from the by-law.

2.2.4 Subwatershed Studies

The proposed development contains a topographical divide such that it falls within two subwatersheds. To the northeast is the Torrance Creek subwatershed, studied by Totten Sims Hubicki *et al.* (1998) as part of the Torrance Creek Subwatershed Study and to the southwest is the Hanlon Creek subwatershed, studied by MMM and LGL in the Hanlon Creek Watershed Plan (1993).The purpose of these studies is to guide future development to protect, enhance and rehabilitate natural features (e.g., woodlots, wetlands, streams, and wildlife).

2.3 GRAND RIVER CONSERVATION AUTHORITY POLICIES AND REGULATION

Pursuant to Ontario Regulation 150/06, prior permission is required from the GRCA for any development within a floodplain, valleyland, wetland, or other hazardous land, any alteration to a river, creek, stream or watercourse or any interference with a wetland. The decision-making policies for such Permits are contained within the *Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (GRCA 2015).

Generally, any development, interference or other alteration that may negatively impact the control of flooding, erosion, dynamic beaches, pollution or the conservation of land are not permitted.

Any development within an area of interference less than or equal to 30 m from a wetland (i.e. 0 to 30 m) may be permitted in accordance with the GRCA Policies in Sections 7.1.2-7.1.3 where an EIS demonstrates that:

- there are no negative or adverse hydrological or ecological impacts on the wetland
- all development is located outside of the wetland and maintains as much setback as feasible
- development is located above the water table (Policy 8.4.7).

Development within an area of interference between 30 and 120 m from a wetland, which in the opinion of the GRCA may result in hydrologic impact, may be permitted where an EIS demonstrates that policies in Sections 7.1.2-7.1.3 – General Policies are met.

2.4 MIGRATORY BIRDS CONVENTION ACT

The *Migratory Birds Convention Act, 1994* (MBCA) prohibits the killing or capturing of migratory birds, and any damage, destruction, removal or disturbance of active nests (i.e. incidental take). Environment and Climate Change Canada (ECCC) provides recommendations to reduce the risk of incidental take and avoid contravention of the MBCA. Their primary recommendation is to avoid engaging in potentially destructive or disruptive activities at key locations or during key periods (ECCC 2014). The key period for nesting birds in the City of Guelph (region C2) is generally defined as the period from the beginning of April until mid-August (ECCC 2014).

If potentially destructive or disruptive activities are required (e.g., vegetation clearing) during the key nesting period, a nest survey may be carried out by a qualified person in simple habitats (e.g., hedgerows, previously cleared area, etc.).

2.5 ENDANGERED SPECIES ACT

The *Endangered Species Act, 2007* (ESA) protects habitat and individuals of wildlife species designated as threatened, endangered, or extirpated in Ontario. Provincial species at risk (SAR) are identified and assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO).

The ESA protects species and their habitats by prohibiting anyone from killing, harming, harassing or possessing protected species, as well as prohibiting any damage or destruction to habitat of protected species. All listed species are provided with general habitat protection under the ESA aimed at protecting areas that species depend on to carry out their life processes, such as reproduction, rearing, hibernation, migration or feeding. Some species have had detailed habitat regulations passed that go beyond the general habitat protection to define specifically the extent and character of protected habitats.

Activities that may impact a protected species or its habitat require the prior issuance of a permit from the Ministry of Environment, Conservation and Parks (MECP), unless the activities are exempted under a Regulation. Ontario Regulation 242/08 identifies activities which are exempt from the permitting requirements of the ESA subject to rigorous controls that include registration of the activity and preparation of mitigation.

2.6 SUMMARY OF POLICY IMPLICATIONS

The policies summarized above provide the context within which the approval of a development plan will be granted from a natural environment perspective. The corresponding opportunities and constraints established by these policies and supporting guidelines should be recognized and addressed through the development design, location and supporting documentation, including the identification of appropriate mitigation and compensation measures to offset potential negative impacts. The intent of this EIS is to demonstrate how the proposed development complies with these policies and will be summarized in **Section 9.0**.

3.0 METHODOLOGY FOR DATA COLLECTION

3.1 BACKGROUND DATA COLLECTION

Background data applicable to the Study Area were obtained through a review of existing documents and information available online. Background resources reviewed include, but are not limited to:

- City of Guelph Official Plan (2018 Consolidation)
- Natural Heritage Information Centre (NHIC) Data (MNRF 2020a)
- Land Information Ontario (LIO) Natural Heritage Mapping (MNRF 2020b)
- Fisheries and Oceans Canada Species at Risk Mapping (DFO 2020)
- City of Guelph Locally Significant Species List (2012)
- Ontario Breeding Bird Atlas (Cadman et al. 2007)
- Ontario Mammal Atlas (Dobbyn 1994)
- Ontario Herpetofaunal Atlas (Ontario Nature 2020)
- iNaturalist and eBird
- GRCA Regulation Mapping (GRCA 2020).

The results of the background data collection were used in the development of the field program, and as such is summarized below.

3.1.1 Designated Natural Heritage Features

The LIO database was accessed in 2018 to aid development of the field program and again in 2020 during the preparation of the EIS. The purpose of this search was to determine the presence or absence of known sensitive natural environment features in the Study Area, including areas of natural and scientific interest (ANSIs), PSWs, environmentally significant areas, provincial or national parks, or conservation areas. LIO identified deer wintering areas and wooded area on the Subject Property while the Study Area also contains portions of the Torrance Creek and Hanlon Creek PSWs (**Figure 1**, **Appendix A**).

The City of Guelph OP identifies components of the Natural Heritage System within the Study Area on Schedule 4, including:

- locally and provincially significant wetlands (Schedule 4A)
- significant woodlands (Schedule 4C)
- significant wildlife habitat (Schedule 4E)
- deer crossing and ecological linkage (Schedule 4).

The Subject Property is located within 120 m of a wetland that is regulated by the GRCA Ontario Regulation 150/06, as shown on **Figure 1** (**Appendix A**).

3.1.2 Species at Risk and Provincially Rare Species

SAR are those species given status rankings by the COSSARO as threatened or endangered in Ontario and receive general habitat protection under the ESA 2007, as discussed in **Section 2.5**. Special concern species are not afforded habitat protection and have been summarized as species of conservation concern (SOCC) along with rare species (i.e., ranked S1-S3), or as federally threatened or endangered.

The NHIC database was accessed in 2018 to assist with development of the field program and checked again in 2020. The purpose was to document the presence/absence of known occurrences of SAR and/or rare floral or faunal species in the vicinity of the Study Area. No species were identified during the search of the NHIC database.

Background wildlife atlases as well as iNaturalist and eBird, as noted in **Section 3.1** above, were searched in 2018 and again in 2020. Seventeen species were identified in background records review as potentially occurring near the Study Area and are summarized in **Table 3.1**

Correspondence from Melinda Thompson at the Guelph District MNRF dated July 12, 2018 (**Appendix B2**) identified the potential for Snapping Turtle within the Study Area.

Table 3.1: Species at Risk and Provincially Rare Species Potentially Occurring on the 1250 Gordon Street Subject Property

Species Name	S-Rank	Provincial Status (COSSARO)	National Status (COSEWIC)	Source	Habitat Requirements	Potential to Exist Within the Subject Property and Study Area
PLANTS						
Butternut (*Juglans cinerea*)	S3?	END	END	COSEWIC 2017	The butternut is a medium-sized tree that is commonly found in a variety of habitats including woodlands and hedgerows (COSEWIC 2017). Butternut is intolerant of shade and occurs singly or in small groups with a variety of associates (Farrar 1995).	Hedgerows and deciduous forest present on the Subject Property. **Likely present on the Subject Property and in the Study Area.**
BUTTERFLIES						
Monarch (*Danaus plexippus*)	S4B, S2N	SC	SC	COSEWIC 2016	In southern Ontario, the Monarch is found primarily wherever milkweed and wildflowers (including goldenrods, asters and purple loosestrife) exist. The larvae occur only where milkweed exists; adults are more generalized, feeding on a variety of wildflower nectar. Habitats include abandoned farmland, along roadsides, and other open spaces where these plants grow (COSEWIC 2016).	Cultural meadow present on the Subject Property. **Likely present on the Subject Property and in the Study Area.**
REPTILES						
Snapping Turtle (*Chelydra serpentine*)	S3	SC	SC	MNRF	Snapping Turtles inhabit ponds, sloughs, streams, rivers, and shallow bays that are characterized by slow moving water, aquatic vegetation, and soft bottoms. Females show strong nest site fidelity and nest in sand or gravel banks at waterway edges in late May or early June (COSEWIC 2008).	Suitable aquatic habitat absent from the Subject Property. Potentially present in wetlands associated with PSWs located in the Study Area. Likely absent from the Subject Property but potentially present within the Study Area.
Eastern Milksnake	S3	-	SC	ORAA	The Eastern milksnake can be found in a variety of habitats, but prefer open areas such as pastures, meadows, prairies, rock outcrops, right-of-ways, and agricultural land	Meadow habitat present on the Subject Property, but onsite residences are not expected to provide suitable habitat.

Table 3.1: Species at Risk and Provincially Rare Species Potentially Occurring on the 1250 Gordon Street Subject Property

Species Name	S-Rank	Provincial Status (COSSARO)	National Status (COSEWIC)	Source	Habitat Requirements	Potential to Exist Within the Subject Property and Study Area
(*Lampropeltis Triangulum*)					(COSEWIC 2014). They commonly feed around old buildings and barns, where rodent populations are high (COSEWIC 2014).	Likely absent from the Subject Property and Study Area.
BIRDS						
Barn Swallow (*Hirundo rustica*)	S4B	THR	THR	OBBA, eBird	The Barn Swallow commonly nests on walls or ledges of barns, bridges, culverts or other man-made structures (COSEWIC 2011a). Where suitable nesting structures occur, Barn Swallow often form small colonies, sometimes mixed with other swallow species (COSEWIC 2011a). The Barn Swallow feeds on aerial insects while foraging over a variety of open habitats such as pastures, lawns, meadows and fields. (COSEWIC 2011). It will also frequently forage in woodland clearings, over wetland habitats or open water where insect prey are abundant (Cadman et al. 2007).	Suitable foraging habitat and potential nesting structures (i.e., residences) present on the Subject Property. **Potentially present on the Subject Property and in the Study Area.**
Bobolink (*Dolichonyx oryzivorus*)	S4B	THR	THR	OBBA	The Bobolink nests primarily in forage crops with a mixture of grasses and broad-leaved forbs, predominantly hayfields and pastures. Preferred ground cover species include grasses such as Timothy and Kentucky bluegrass and forbs such as clover and dandelion (COSEWIC 2010). Bobolink is an area-sensitive species, with reported lower reproductive success in small habitat fragments (COSEWIC 2010).	Suitably large grassland habitat absent from the Subject Property. Likely absent from the Subject Property and Study Area.

Table 3.1: Species at Risk and Provincially Rare Species Potentially Occurring on the 1250 Gordon Street Subject Property

Species Name	S-Rank	Provincial Status (COSSARO)	National Status (COSEWIC)	Source	Habitat Requirements	Potential to Exist Within the Subject Property and Study Area
Common Nighthawk (*Chordeiles minor*)	S4B	SC	THR	OBBA	The Common Nighthawk is an aerial insectivore and forages at dawn and dusk. Common Nighthawks nest on the ground in open habitats preferably with rocky or graveled substrate. Nighthawks will even nest on gravel roofs in the city. The regeneration or succession of forest clearings and the destruction of grassland habitats appear to play a major role in this species' decline along with the non-selective spraying for mosquitoes (Cadman et al., 2007).	Suitable nesting habitat (i.e., limited open area, unsuitable substrate) is absent from the Subject Property but foraging habitat is present in the Study Area. **Potentially present in the Study Area.**
Chimney Swift (*Chaetura pelagica*)	S4B, S4N	THR	THR	OBBA	Chimney Swifts use chimneys for roosting and breeding, and less commonly, nest in large hollow trees (COSEWIC 2018a). Nesting sites typically have a constant ambient temperature (COSEWIC 2018a). It is an aerial insectivore, and often forages near water (COSEWIC 2018a).	Residences with chimneys present on the Subject Property and in the Study Area. **Potentially present on the Subject Property and in the Study Area.**
Eastern Meadowlark (*Sturnella magna*)	S4B	THR	THR	OBBA	The Eastern Meadowlark is typically found in fields, meadows, golf courses, pastures, alfalfa fields, roadsides and other open areas (COSEWIC 2011b). Older sites with moderately tall grass, a substantial litter layer, low forb and shrub cover and dense grass are preferred (COSEWIC 2011b). Larger patch sizes (>5 ha) are also generally preferred (COSEWIC 2011b).	Meadow habitat on the Subject Property is small and fragmented. Habitat absent from the Study Area. Likely absent from the Subject Property and Study Area
Eastern Wood-pewee (*Contopus virens*)	S4B	SC	SC	OBBA	The Eastern Wood-pewee is found in the mid-canopy layer of deciduous and mixedwood forests with open understories and is commonly associated with edges and clearings (COSSARO 2013).	Forested habitat is present on the Subject Property and in the Study Area.

Table 3.1: Species at Risk and Provincially Rare Species Potentially Occurring on the 1250 Gordon Street Subject Property

Species Name	S-Rank	Provincial Status (COSSARO)	National Status (COSEWIC)	Source	Habitat Requirements	Potential to Exist Within the Subject Property and Study Area
						Likely present on the Subject Property and in the Study Area
Grasshopper Sparrow (*Ammodramus savannarum*)	S4B	SC	SC	OBBA	The Grasshopper Sparrow is found in large (>5 ha) sparsely vegetated grasslands, hay fields, pastures, prairies and alvars with well-drained, sandy soil (COSEWIC 2013a). The nests are typically well hidden in grasses (COSEWIC 2013a).	Meadow habitat on the Subject Property is small and fragmented. Habitat absent from the Study Area. Likely absent from the Subject Property and Study Area
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	S4B	SC	THR	OBBA	The Red-headed Woodpecker prefers open woodlands and forest edges and is often found in disturbed areas such as cemeteries, parks and golf courses (COSEWIC 2018b). This species shows a preference for dead or dying trees and at least a few snags or large dead limbs are necessary for its presence in more open habitats (COSEWIC 2018b).	Small woodlands, disturbed areas, and forest edges present on the Subject Property but absent from the Study Area. **Potentially present on the Subject Property but likely absent from the Study Area.**
Wood Thrush (*Hylocichla mustelina*)	S4B	SC	THR	OBBA	The Wood Thrush is found in deciduous and mixed forests with a developed understorey and tall trees (COSEWIC 2012). While it prefers large forest tracts, it will utilize smaller forest fragments (COSEWIC 2012). Nests are constructed in shrubs or saplings, typically Sugar Maple or American Beech (COSEWIC 2012).	Forested habitat present on the Subject Property and in the Study Area. **Likely present on the Subject Property and in the Study Area**
MAMMALS						
Little Brown Myotis (*Myotis lucifugus)*	S5	END	END-NS	COSEWIC 2013b	The Little Brown Myotis is commonly found near waterbodies in buildings, attics, roof crevices and under loose bark on trees or under bridges (COSEWIC 2013b).	Forested habitat and residences present on the Subject Property. **Likely present on the Subject Property and in the Study Area.**

Table 3.1: Species at Risk and Provincially Rare Species Potentially Occurring on the 1250 Gordon Street Subject Property

Species Name	S-Rank	Provincial Status (COSSARO)	National Status (COSEWIC)	Source	Habitat Requirements	Potential to Exist Within the Subject Property and Study Area
Northern Myotis (*Myotis septentrionalis*)	S3?	END	END-NS	COSEWIC 2013b	The Northern Myotis is typically found foraging for aerial insects in the forest understorey (COSEWIC 2013b). Maternity roosts are located under bark or in buildings with young born in June and July while hibernating colonies typically reside in cave crevices (COSEWIC 2013b).	Forested habitat and residences present on the Subject Property. **Likely present on the Subject Property and in the Study Area.**
Tri-colored Bat (*Perimyotis subflavus*)	S3?	END	END	AMO	The Tri-coloured Bat roosts in colonies in tree cavities (COSEWIC 2013b) in a wide variety of deciduous and coniferous forest stands. Little is known about the effect of stand composition on maternity roost selection for this species, but it is strongly associated with forest watercourses and streamside vegetation (COSEWIC 2013b).	Forested habitat present based on the Subject Property and in the Study Area. **Likely present on the Subject Property and in the Study Area.**
Eastern Small-footed Myotis (*Myotis leibii*)	S2S3	END	-	AMO	The Eastern Small-footed Myotis roosts in a variety of habitats, including hollow trees, under rocks or in rock outcrops, in buildings, caves, mines and under bridges (Humphrey 2017). Different roosting sites may be selected each day (Humphrey 2017). Hibernation occurs in abandoned mines and caves (Humphrey 2017).	Buildings and hollow trees present on the Subject Property, but this species is extremely rare. **Potentially present on the Subject Property and in the Study Area.**

3.2 FIELD INVESTIGATIONS

Field investigations in 2018 and 2019 examined the Subject Property as shown on **Figure 2** (**Appendix A**), and adjacent lands where access permitted.

The hydrogeological investigation of the Subject Property began in July 2018 with the installation of groundwater monitoring wells at seven locations (five locations with single wells, two locations with multi-level well installations), with a multi-level drive-point piezometer (shallow and deep pipe) being installed in the Torrance Creek Swamp in April 2019. Continuous monitoring of groundwater level fluctuations in the monitoring wells and drive-point piezometer occurred from July 2018 to January 2020, with hydraulic conductivity testing and groundwater quality sampling at these locations occurring in July and September 2018, respectively.

Field investigations included woodland and wetland boundary delineations, spring, summer and fall botanical inventories, tree inventory, the characterization and mapping of vegetation communities using the Ecological Land Classification (ELC) system, as well as habitat assessment for SAR and SWH.

Targeted field surveys included amphibian call count surveys, bat roost habitat assessments, bat exit surveys, breeding bird surveys, woodland raptor nest searches, terrestrial crayfish survey, snake habitat assessment, deer movement studies, and a butterfly, dragonfly, and bee survey.

A summary of field work completed by Stantec (unless otherwise noted) is provided in **Table 3.2**. Field investigation methods are described in the sections below with results detailed in **Sections 4.3** and **4.4.**

Table 3.2: Summary of Field Work Conducted for the 1250 Gordon Street Study Area, 2018

Type of Field Work	Date(s) of Field Work	Personnel
Hydrogeological Surveys		
Borehole drilling and monitoring well installations	July 9 - 30, 2018	Drilling Contractor: Aardvark Drilling Inc. C. Davis and A. Healey
Hydraulic conductivity testing	July – September, 2018	D. Smith
Groundwater level monitoring and quality testing	January – December (i.e. year-round)	S. Baer and D. Smith
Boundary Delineations		
Wetland Boundary Delineation	May 16, 2019	M. Straus R. Hamlin, GRCA L. Lefler, City of Guelph
Woodland Boundary Delineation	October 2014 July 2017	Natural Resources Solutions Inc. (NRSI) Staff City of Guelph Staff

Table 3.2: Summary of Field Work Conducted for the 1250 Gordon Street Study Area, 2018

Type of Field Work	Date(s) of Field Work	Personnel
Vegetation Surveys		
ELC	June 6, 2018 July 5, 2018 September 11, 2018	M. Straus
Tree Inventory	December 19, 2019	NRSI Staff
Preliminary Tree Inventory – Butternut DNA Testing (Stantec)	July 8, 2019	B. Miller
Spring Botanical Inventory	June 6, 2018	M. Straus
Summer Botanical Inventory	July 5, 2018	M. Straus
Fall Botanical Inventory	September 11, 2018	M. Straus
WILDLIFE SURVEYS		
Amphibian Survey Round 1	May 7, 2018	D. Eusebi
Amphibian Habitat Assessment	May 28, 2018	D. Eusebi
Bat Roost Habitat Assessment	May 11, 2018 June 12 and 13, 2018	M. Benner, A. Taylor and N. Taylor
Bat Exit Surveys	June 12, 13, 14, 19, 21, 25 and 26, 2018	D. Eusebi, A. Taylor, K. Zupfer, M. Cameron, N. Taylor, M. Ellah, E. Hartwig, P. Worsell and N. Kopysh
Breeding Bird Surveys	June 12, 2018 July 5, 2018	M. Straus
Crepuscular Bird Surveys	June 12, 13, 14, 19, 21, 25 and 26, 2018	D. Eusebi, A. Taylor, K. Zupfer, M. Cameron, N. Taylor, M. Ellah, E. Hartwig, P. Worsell and N. Kopysh
Woodland Raptor Nest Search	May 28, 2018 June 6 and 12, 2018	D. Eusebi and M. Straus
Terrestrial Crayfish Survey	June 6 and 12, 2018 July 5, 2017 September 11, 2018	M. Straus
Snake Habitat Assessment and Incidental Surveys	Snake Habitat Assessment: November 23, 2018 Incidental Surveys: April 26, 2018; June 12, 13, 14, 29, 21, 25, 26; July 5; September 11, 2018.	M. Straus and K. Zupfer

Table 3.2: Summary of Field Work Conducted for the 1250 Gordon Street Study Area, 2018

Type of Field Work	Date(s) of Field Work	Personnel
Deer Movement Surveys	November 1, 2018 – January 31, 2019	K. Zupfer
Wildlife Habitat Assessment, including SAR and SOCC	April 26, 2018 June 12, 2018	M. Straus
Butterfly and Dragonfly Survey	August 15, 2018	D. Eusebi, A. Taylor and N. Taylor
Incidental Surveys	All visits	All staff

3.2.1 Geotechnical and Hydrogeology

In 2018, CMT Engineering Inc. competed a geotechnical study for the Subject Property, which involved the drilling of 10 boreholes, as shown on **Figure 2**, **Appendix A**. The borehole locations targeted the proposed footprint of the apartment complex, providing information on the geotechnical properties of the onsite soils and preliminary observations of groundwater conditions. Full details of the geotechnical study are provided in **Appendix D**.

The hydrogeological field investigation consisted of drilling nine boreholes (seven locations; **Figure 2**, **Appendix A**) within the Subject Property between July 9 and 30, 2018, with each borehole being equipped with a monitoring well. Stantec personnel also installed one multi-level drive-point piezometer into the Torrance Creek Swamp, approximately 65 m to the northeast of the Subject Property (April 10, 2019), to evaluate vertical hydraulic gradients beneath this feature (i.e., groundwater recharge and/or discharge function) and its potential hydraulic connection to the Subject Property. Overall, the monitoring wells together with the drive-point piezometers were strategically positioned throughout the Subject Property to obtain a spatially representative understanding of soil conditions, groundwater depths and fluctuations, and to evaluate local patterns of groundwater flow. Leveloggers were suspended in the monitoring wells and drive-point piezometers to obtain continuous groundwater level measurements from July 2018 to January 2020. On July 26 and 27, 2018 Stantec personnel performed in-situ hydraulic response testing on each monitoring well to calculate the horizontal hydraulic conductivity of the subsurface deposits. Groundwater samples were collected from four of the monitoring wells and submitted to an accredited laboratory for the analysis of parameters against the Ontario Drinking Water Quality Standards and the City of Guelph Sanitary and Storm Sewer By-law. A full discussion of the hydrogeological investigation methodology is provided in **Appendix E**.

3.2.2 Vegetation Communities

Vegetation communities were mapped and described using the ELC field guide for southern Ontario (Lee et al. 1998). Updates to vegetation community names and codes followed the 2008 catalogue of ELC vegetation communities. Scientific nomenclature of plant species follow Brouillet et al. (2010+, accessed

2018). Mapping was completed to the finest level of resolution (vegetation type) where possible. Vegetation communities were first identified on aerial imagery and then checked in the field. Provincial significance of vegetation communities was based on the rankings assigned by the NHIC (MNRF 2020a). Vegetation mapping for the Subject Property and surrounding Study Area was completed in conjunction with seasonal botanical inventories.

Survey date, time, weather conditions, and personnel in 2018 are provided below in **Table 3.3.**

Table 3.3: Vegetation Survey Date, Time and Weather Conditions

SURVEY	DATE/TIME	WEATHER				SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
1	June 6, 2018 10:30 – 16:30	12	2	100	None / none	M. Straus
2	July 5, 2018 12:00 – 15:00	26	1	0	None / none	M. Straus
3	September 11, 2018 11:00 – 14:00	17	2	50	None / rain	M. Straus

3.2.3 Vascular Plant Species

A three-season botanical inventory was completed in 2018 to consider late spring (June), early summer (July) and fall (September) timing windows. Early spring surveys were not proposed in the original ToR due to a perceived lack of habitat (i.e., undisturbed deciduous woodlots) where early spring ephemeral vegetation would be expected on the Subject Property. Furthermore, 2018 experienced a late April ice storm and as such spring flower emergence was also delayed. Therefore, the early June date for the spring botanical inventory was considered appropriate.

Plant species status were considered and evaluated using the Rare Vascular Plants of Ontario, Fourth Edition (Oldham and Brinker 2009) for provincial significance; provincial and federal status will reference SARO. Identification of potentially sensitive native plant species will be determined based on their assigned coefficient of conservatism (CC) value, as determined by Oldham et al. (1995). CC values range from 0 (low) to 10 (high) based on a species' tolerance of disturbance and fidelity to a specific natural habitat. Species with a high CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters. Locally significant species were based on *Locally Significant Species List – City of Guelph 2012.*

Survey dates, times, weather conditions, and personnel are provided below in **Table 3.4**.

Table 3.4: Botanical Inventory Survey Dates, Times and Weather Conditions

SURVEY	DATE/TIME	WEATHER				SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
1	June 6, 2018 10:30 – 16:30	12	2	100	None / none	M. Straus
2	July 5, 2018 12:00 – 15:00	26	1	0	None / none	M. Straus
3	September 11, 2018 11:00 – 14:00	17	2	50	None / rain	M. Straus

3.2.4 Wetland Delineation

Wetland delineation was based on the protocols outlined in the Ontario Wetland Evaluation System (OWES) (MNRF 2014). Generally, wetland boundaries are defined using the 50% vegetation rule, which involves the relative cover of wetland plant species (e.g., species that may or primarily occur in wetlands) to upland plants. Wetlands exist where >50% of the cover is comprised of wetland plants. This approach begins with the tree canopy, but where a tree canopy does not exist, or is inconclusive, the shrub or herbaceous layer is then assessed using the same 50% rule. In situations where the boundary is not obvious, additional evidence such as soil samples, density of herbaceous layer, and indicators of past surface water levels are also used.

The boundary of the Torrance Creek PSW was delineated initially by NRSI with the GRCA in 2014. As the statute for wetland boundary delineations is 5 years, the PSW boundary was revisited and re-demarcated on May 16, 2019 with Ryan Hamelin of the GRCA and Leah Lefler from the City. The final boundary was recorded in the field by Stantec using a sub-meter, hand-held GPS (Global Positioning System) Unit.

3.2.5 Woodland Delineation

The boundary of the significant woodlot was delineated initially by NRSI with the City of Guelph in 2014 and revisited in 2017. Use of this significant woodlot boundary for the proposed development was approved by the City of Guelph (**Appendix B1**).

3.2.6 Tree Inventory

Stantec conducted a preliminary tree inventory on the Subject Property in 2018 and 2019. During the inventory, butternut trees were documented. Butternuts have been documented hybridizing with at least two non-native trees, Persian/English or Japanese walnut. Although an examination of a variety of characteristics can aid in the identification of true butternuts from hybrids, the most accurate method to determine whether a tree is a true butternut, or a hybrid, is using DNA testing. The Ontario Forest

Research Initiative lab provides this testing service. A sample was taken and sent for DNA testing from one of the identified butternut (tree #372).

NRSI was retained in 2014 by the previous landowner of the Subject Property, completing a tree inventory of the Subject Property at that time. A compilation of NRSI's original 2014 tree inventory data, supplemented with more recent inventory data provided by Stantec, was field verified on December 19, 2019 by NRSI. Methods of the tree inventory included an assessment of any trees 10 cm diameter at breast height (DBH) and greater by a Certified Arborist. Trees located within the property area were tagged with a pre-numbered aluminum forestry tree tag and those within monoculture hedgerow features, a polygon method was used. The location of trees inventoried was surveyed using an SXBlue II GNSS GPS unit.

Data collected for each tree inventoried included:

- tree identifier
- tree species (common and scientific name)
- DBH
- crown radius
- general health (excellent, good, fair, poor, very poor, dead),
- potential for structural failure (improbable, possible, probable, imminent),
- tree location (on-site/boundary/off-site), and,
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

Full details on methods can be found in the TPP in **Appendix F**.

3.2.7 Amphibian Survey and Habitat Assessment

Amphibian call count surveys were conducted in accordance with the guidelines provided by the Marsh Monitoring Program manual (Bird Studies Canada and Environment Canada 2008). Breeding amphibian surveys were conducted to target the Torrance Creek Swamp PSW and were conducted 30 minutes after sunset and no later than midnight on nights with light or no winds with the following nighttime air temperatures:

- April >5^{o}C
- May > 10^{o}C
- June > 17^{o}C

A spring survey was conducted on May 7, 2018 in accordance with parameters outlined above. This survey was conducted to target the early breeding amphibian window for April, but due to cold spring temperatures, this survey was moved to early May. Based on a lack of amphibian calls recorded, a habitat assessment to identify suitable amphibian breeding habitat was conducted on May 28, 2018. As no suitable breeding amphibian habitats were identified (i.e., areas of vernal pooling) subsequent breeding amphibian surveys were not completed.

3.2.8 Bat Habitat and Exit Surveys

Bat roosting habitat may occur in the buildings and mature trees on the Subject Property and in the forested portion of the Study Area. Habitat assessments and exit surveys were conducted for bats in 2018 and are detailed below.

3.2.8.1 Bat Habitat Assessment

In 2018, the four buildings located on the Subject Property were assessed for suitable entry/exit points for bats. The habitat assessment identified potentially suitable roosting habitat in the buildings, which were subsequently surveyed using exit surveys as discussed in **Section 3.2.8.2**

Large mature trees were assessed to identify trees ≥10 cm DBH with cavities, cracks, or peeling bark that may support Little Brown or Northern Myotis roosting and any oaks ≥ 10 cm DBH, maples ≥ 10 cm DBH with dead leaf clusters, or any maple ≥25 cm DBH to support Tri- coloured Bat, in accordance with established protocols for forested areas (MNRF 2017). Isolated snags were also sought outside of the forested areas, in proximity to the residences during habitat assessments.

The identification of large maples and snags in the forested areas as well as isolated snags outside of the forested areas on the Subject Property triggered two types of acoustic surveys, as detailed in **Section 3.2.8.2**.

Survey date, time, weather conditions, and personnel are provided below in **Table 3.5**.

Table 3.5: Bat Maternity Roost Survey Date, Time and Weather Conditions

SURVEY	DATE/TIME	WEATHER				SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
1	May 11, 2018 10:00 – 13:00	11	2	90	None / rain	M. Benner

3.2.8.2 Bat Exit Surveys

As potentially suitable bat roost habitat was identified on the Subject Property, acoustic surveys were completed in June 2018. This consisted of exit surveys at the buildings and isolated snag trees identified as well as automated acoustic recordings placed in the forested areas.

Buildings and isolated trees identified during the habitat assessment as shown on **Figure 2** (**Appendix A**) were surveyed in accordance with *Surveying for the presence of Little Brown Myotis and Northern Myotis* (MNR 2013). This consisted of observers watching the identified buildings and trees looking for signs of bats exiting or entering the buildings and/or trees using binoculars and flashlights, as well as use of an acoustic monitoring device to record bat calls for species identification. Surveys started 30 minutes before dusk and finished 60 minutes after dusk.

Automated acoustic recording devices were placed in the forest community for a minimum of 10 nights. Recorded calls were identified where possible to species or group of similar species using Kaleidoscope and quality reviewed by a qualified biologist. The locations of the automated acoustic records are provided on **Figure 2** (**Appendix A**).

Survey dates, times, weather conditions, and personnel are provided below in **Table 3.6**.

Table 3.6: Bat Exit Survey Dates, Times and Weather Conditions

SURVEY	DATE/TIME	WEATHER				SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
1	June 12, 2018 20:30 – 22:00	24	3	100	None / none	D. Eusebi, A. Taylor, K. Zupfer and M. Cameron
2	June 13, 2018 20:30 – 22:00	21	2	5	None / none	D. Eusebi and N. Taylor
3	June 14, 2018 20:30 – 22:00	16	1	0	None / none	A. Taylor and N. Kopysh
4	June 19, 2018 20:30 – 22:00	20	0	80	None / rain	P. Worsell and D. Eusebi
5	June 21, 2018 20:45 – 21:15	20	1	5	None / none	M. Ellah and K. Zupfer
6	June 25, 2018 20:30 – 22:00	21	7	0	None / none	E. Hartwig and K. Zupfer
7	June 26, 2018 20:30 – 22:00	20	0	80	None / none	N. Taylor and E. Hartwig

3.2.9 Breeding Bird Surveys

3.2.9.1 Diurnal Surveys

Two breeding bird surveys were conducted on the Subject Property in June and July 2018 in accordance with the Breeding Bird Atlas (Cadman et al., 2007). Fieldwork was conducted at, or within, half an hour of sunrise, and completed by 10:00 am and under favorable weather conditions.

Surveys consisted of recording all species of birds that were seen or heard within each habitat while traversing the Subject Property. A conservative approach to determining breeding status was taken, birds seen or heard in appropriate habitat during the breeding season was assumed to be breeding.

Survey dates, times, weather conditions, and personnel are provided below in **Table 3.7**.

Table 3.7: Breeding Bird Survey Dates, Times and Weather Conditions

SURVEY	DATE/TIME	WEATHER				SURVEYORS
		Temp. (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
1	June 12, 2018 8:30 – 9:30	15	1	0	None / none	M. Straus
2	July 15, 2018 7:45 – 10:00	20	0-1	0	None / none	M. Straus

3.2.9.2 Crepuscular Surveys

Crepuscular surveys for Common Nighthawk and Chimney Swift were conducted in conjunction with bat exit surveys in June. Surveys began at sunset and occurred on calm, clear, and warm evenings (>10˚C). All birds seen or heard during evening bat surveys were recorded.

3.2.10 Woodland Raptor Nest Survey

Surveys for woodland raptors were undertaken in late May and early June in conjunction with the amphibian habitat assessment, vegetation and breeding bird surveys. The forested areas of the Subject Property and the adjacent PSW were systematically searched for stick nests as well as recording any observations (auditory or visual) of any raptor species.

3.2.11 Terrestrial Crayfish

Terrestrial crayfish surveys were conducted by systematically searching for their distinctive chimneys within 100 m of the wetland boundary (as shown on **Figure 3**, **Appendix A**) during vegetation and breeding bird surveys conducted on the Subject Property.

3.2.12 Snake Habitat Assessment

Snake habitat, including hibernacula features such as underground foundations, cracks and crevices, and stone piles were assessed. As hibernacula requires access to below the frost line to be considered candidate SWH, buildings within the Subject Property were assessed. Any incidental snakes observed during other field investigations were recorded

Survey dates, times and weather conditions are provided below in **Table 3.8**.

Table 3.8: Snake Habitat Assessment Survey Dates, Times and Weather Conditions

SURVEY	DATE	WEATHER				SURVEYORS
		Temp. °C	Wind (Beaufort Scale)	Cloud %	PPT / PPT last 24 hours	
1	July 5, 2018	26	1	0	None/none	M. Straus
2	November 23, 2018 13:00 – 15:00	3	3	0	None / none	K. Zupfer

3.2.13 Wildlife Movement Study

Five wildlife cameras were used to document wildlife movement activity on the Subject Property. Cameras were installed in early November 2018 and deployed until the end of January 2019. This timing was proposed to capture deer movement into the identified overwintering area (as shown on **Figure 1, Appendix A**) and is consistent with deer movement studies undertaken elsewhere in the City of Guelph. Camera deployment locations are shown on **Figure 2** (**Appendix A**) and were chosen to address sightlines, north-south and east-west movement opportunities, and acknowledges feedback from EAC on September 12, 2018. Additional correspondence between Stantec (Melissa Straus) and City staff (Leah Lefler) was undertaken so that studies could begin within the proposed time frame, with City approval of the proposed approach provided on October 19, 2018 (**Appendix B1**).

3.2.14 Butterflies, Dragonflies, and Bees

An area search on the Subject Property was undertaken for butterflies (taxonomic order: Laepidoptera, excluding moths), dragonflies (spreadwings and damselflies; taxonomic order: odonata), and bees (genus: Bombus). The survey route meandered to incorporate features where butterflies and/or dragonflies were likely to concentrate (e.g., woodland edge, meadows, nectar plants, wetlands, open water or habitat containing butterfly larval host plants). Whenever possible, species were identified at a distance using binoculars. If identification through binoculars was not possible, then individuals were captured using an aerial net and identified in the hand. Species, number, notes on habitat and behavior were recorded.

One survey was conducted on August 15, 2018 under suitable weather conditions, including low wind conditions (i.e. 0-2 on the Beaufort scale) with little cloud cover (i.e. less than or equal to 20%), warm temperatures, and between 10:00 and 17:00.

3.2.15 Other Wildlife Observations

Wildlife or signs of wildlife were recorded during all field investigations, including species identified by sight, sound, or through distinctive signs (e.g., scat, tracks).

Wildlife habitat assessments were completed on the Subject Property in conjunction with vegetation surveys for each ELC community to determine suitability of the Subject Property to support SWH types identified as potentially occurring in the ToR screening table (**Appendix C**) or SAR identified during the background review. Surveys undertaken on the Subject Property cover the range of active and breeding periods of the target species.

4.0 SITE DESCRIPTION AND NATURAL FEATURES

4.1 GENERAL OVERVIEW OF SITE CONDITIONS

The Subject Property is comprised of four residential properties, three fronting on Gordon Street and one fronting on Valley Road. Beyond the landscaping and hedgerows associated with each of the residential areas, the Subject Property consists of culturally influenced lands, including a centralized disturbed meadow surrounded by woodland, plantation, and hedgerow communities.

Adjacent lands consist of residential areas and roads, as well as forest and wetland features associated with the Torrance Creek and Hanlon Creek PSW.

4.2 LANDSCAPE CONTEXT

4.2.1 Physiography and Topography

The Subject Property is situated within the physiographic region referred to by Chapman and Putnum (1984) as the Guelph Drumlin Field, a series of broad oval type hills with axes trending in a northwest to southeast direction (i.e., drumlins). The Subject Property sits upon a drumlin, which is comprised of glacial till (i.e., stony, silty sand to sandy silt till). The drumlin groupings in this physiographic region occur in swampy valleys that are flanked by terraced spillway channels of sand and gravel, which contain tributaries of the Grand River (e.g., Torrance Creek Swamp located northeast of the Subject Property). Gravel ridges or eskers are also known to cut through the till plain in the same general direction of the drumlins.

Most of the Subject Property lies within the Torrance Creek subwatershed, with the southwestern portions of the property being located within the Upper Hanlon Creek Watershed. Both subwatersheds occur within the Grand River Watershed. The Torrance Creek subwatershed is characterized by hummocky terrain associated with the drumlins and by the network of broad, relatively flat spillway channels that cut through the drumlin fields. Topographic high points occur along the northwestern and southeastern boundaries within the central portion of the Subject Property, with the topography generally sloping to the northeast towards Torrance Creek PSW and the southwest towards Gordon Street (Section 2.1 of **Appendix E**). As discussed in the FSR (**Appendix G**), the direction of surface water runoff occurring within the Subject Property under existing conditions is split between two catchments: Catchment 101 directs surface water runoff westward to an existing storm sewer on Gordon Street, whereas runoff in Catchment 102 flows overland to the east and eventually discharges to the Torrance Creek PSW.

4.2.2 Geology and Hydrostratigraphy

Geological conditions throughout the region in which the Subject Property is located consist of the following, listed from youngest to oldest:

- **Organic Deposits:** Accumulations of peat and/or muck associated with wetland areas.
- **Glaciofluvial Deposits:** Glaciofluvial outwash and glaciolacustrine deposits of sand and gravel with minor silt and clay associated with the spillway channels.
- **Ice-Contact Deposits:** Predominantly sand and gravel containing lenses of silt and clay left behind by the melting of enclosed ice blocks (i.e., eskers, kames).
- **Port Stanley Till:** An occasionally stony, silty sand to sandy silt till, forming the till plain and drumlins that characterize the region. Some of the drumlins, however, can consist of an older clayey silt till core that is subsequently covered by a veneer of Port Stanley Till. In the areas south of the Speed River, the till plain is often covered by a layer of glaciofluvial and glaciolacustrine sediments (i.e., fine to silty sand, sandy silt, sand and gravel) deposited from melting glacier ice, with the till extending to the bedrock surface.
- **Bedrock:** The Eramosa Formation (Reformatory Quarry Member), representing the uppermost bedrock unit beneath the Site is described as a light brown to cream coloured, pseudonodular, thickly bedded and coarsely crystalline dolostone dolostone, which may act as an aquitard.

Subsurface investigation completed on the Subject Property indicate that silty sand to sandy silt till (Port Stanley Till) predominantly forms a horizontally and vertically contiguous unit beneath the Subject Property, with this unit being overlain by a 2.3 to 4.8 m thick deposit consisting of very loose to dense sand and silt, with some gravel and trace clay. A 2.4 m thick, discontinuous layer of sand was encountered in the Port Stanley Till at a depth of 11.3 m BGS (331.7 m above mean sea-level [AMSL]) at one of the monitoring well locations. The Port Stanley Till occurs at elevations ranging from 341.6 to 334.7 m AMSL beneath the Subject Property, with this unit extending to the termination depth of the onsite boreholes (333.4 to 324.6 m AMSL). Locally, the bedrock surface is reported to occur at an elevation of approximately 320 m AMSL.

Figures providing a visual interpretation of the hydrostratigraphic units found beneath the Subject Property can be found in the Hydrogeological Assessment report (**Appendix E**).

4.3 HYDROGEOLOGY

Based on previously completed groundwater modeling work, the following aquifer and aquitard systems are identified as occurring throughout the region in which the Subject Property resides:

- **Upper Sand and Gravel Aquifer:** an unconfined aquifer system consisting predominantly of outwash sand and gravel deposits. This unit is reported to have a horizontal hydraulic conductivity ranging from 7.0×10^{-4} m/s to 6.0×10^{-6} m/s.

- **Lower Till Aquitard:** dense sandy to silty glacial till (i.e., Port Stanley Till) that is occasionally interbedded with discontinuous lenses of coarse sand and gravel. This unit is reported to have a horizontal hydraulic conductivity ranging from 1.0 x 10^{-4} m/s to 2.0 x 10^{-9} m/s.
- **Contact Zone Aquifer:** coarse, unconsolidated granular deposits directly overlying, and hydraulically connected to, upper weathered/fractured bedrock. This unit typically forms a thin aquifer having an assumed thickness of four meters (two meters above and below bedrock surface) (Golder Associated Ltd. 2011). This aquifer is reported to have a horizontal hydraulic conductivity ranging from 1.0 x 10^{-4} m/s to 1.0 x 10^{-5} m/s.
- **Bedrock Aquifer:** consisting of medium to thick bedded fossiliferous dolostone of the Guelph Formation. This unit is reported to have a horizontal hydraulic conductivity ranging from 8.0 x 10^{-3} m/s to 7.0 x 10^{-9} m/s. The groundwater table is positioned within the Port Stanley Till (Lower Till Aquitard) and the layer of sand and silt that occurs above this glacial till. Groundwater levels throughout the Subject Property fluctuated between 1.0 m and 9.2 m below ground surface (BGS) over the monitoring period, equating to elevations ranging from 332.6 m to 340.7 m AMSL. Groundwater levels showed no marked response to notable precipitation events (i.e., immediate spike/rise in the groundwater table), suggesting that there is no direct hydraulic connection between the ground surface and the groundwater system (i.e., via fissures/fractures in the shallow overburden). This subdued response to precipitation events is not surprising, given that the largely dense to very densely packed deposits of silty sand to sandy silt present beneath the Subject Property are characterized by lower permeability, having horizontal hydraulic conductivities in the range of 10^{-7} to 10^{-9} m/s.

In general, groundwater contours mimic the prevailing topography of the Subject Property, with a localized groundwater divide running from northeast-southwest through the centre of the property. From the divide, groundwater is shown to flow to the northeast across the Subject Property towards Torrance Creek PSW at an estimated velocity of 0.23 m/year (i.e., one meter every 4.3 years). However, groundwater is also shown to flow to the southwest from the divide towards Gordon Street at an estimated velocity of 0.52 m/year (i.e., one meter every 1.9 years). These groundwater flow patterns also mimic existing surface water runoff / drainage patterns occurring at the Subject Property.

The Subject Property is characterized by downward vertical hydraulic gradients, which ranged from -0.5 to -1.0 over the monitoring period and indicating that the site is a groundwater recharge area. Neutral (neither recharge or discharge condition) to upward vertical hydraulic gradients (discharge condition) consistently occur in the adjacent Torrance Creek Swamp, although the vertical gradient is observed to switch to downward (recharge condition). However, the potential volume of groundwater discharging to the Torrance Creek PSW during those periods where discharge conditions are present is expected to be minimal, given that groundwater moves at a very slow rate through the overburden deposits (i.e., 1 m every 4.3 years).

Infiltration rates across the Subject Property are estimated to range from 5 millimeters (mm) to 21 mm/hour, indicating that the Subject Property is characterized by low infiltration potential.

Groundwater beneath the Subject Property is classified as calcium-bicarbonate type groundwater, which is typical of shallow fresh groundwater systems in Ontario. Parameters tested in the groundwater samples did not exceed any corresponding Ontario Drinking Water Quality Standards health-related criteria. Further details on existing hydrogeological conditions encountered at the Subject Property are provided in **Appendix E**.

4.4 TERRESTRIAL RESOURCES

Results of the terrestrial field investigations are summarized in the sections below, with field notes provided in **Appendix H.** Scientific names of plant and wildlife species can be found in **Appendix I**.

4.4.1 Vegetation Communities

The communities identified in the Study Area are shown on **Figure 3, Appendix A**. All communities identified are considered common in southern Ontario. A brief description of the communities is provided below in **Table 4.1.**

Table 4.1: Ecological Land Classification (ELC) Vegetation Types

ELC Type	Community Description
Cultural (CU)	
CUM1 Mineral Cultural Meadow	Centralized disturbed meadow, dominated by orchard grass, common Timothy and goldenrod in the ground layer, with common buckthorn and Tartarian honeysuckle in the understorey and scattered white elm in the canopy. A small cultural meadow pocket located behind 1242 Gordon consists of predominantly maintained lawn and a few fruit trees.
CUP3 Coniferous Plantation	Coniferous plantation dominated by Norway spruce with some black walnut. Occasional goldenrod present in the ground layer.
CUP3-3 Scotch Pine Coniferous Plantation	Coniferous plantation dominated by Scotch pine. Common buckthorn and goldenrod abundant in the understorey and ground layer.
CUW Cultural Woodland	Cultural woodland fragment along Edinburgh Road South. Poplar, Norway spruce, Manitoba maple and Scotch pine were noted.
Coniferous Forest (FOC)	
FOC2-2 Dry-Fresh White Cedar Coniferous Forest	Upland monoculture of eastern white cedar with rare occurrences of black cherry in the canopy. Ground cover was very limited, with a few patches of sensitive fern and wild lily-of-the-valley.
FOCM5 Naturalized Coniferous Hedgerow	Series of connected hedgerows surrounding the residences dominated by Norway spruce with eastern white cedar. Common buckthorn was noted in the understorey with a variable ground layer, consisting of sparsely vegetated areas to areas dominated by garden escapees (e.g., periwinkle) or other areas dominated by garlic mustard and avens species.

Table 4.1: Ecological Land Classification (ELC) Vegetation Types

ELC Type	Community Description
Deciduous Forest (FOD)	
FOD5-6 Dry – Fresh Sugar Maple – Basswood Deciduous Forest	Deciduous forest dominated by sugar maple and basswood. Sparse understorey with occasional common buckthorn. Ground layer dominated by enchanter's nightshade and goldenrod.
Deciduous Woodland (WOD)	
WODM4-4 Dry – Fresh Black Walnut Deciduous Woodland	Deciduous woodland dominated by black walnut with occasional sugar maples. Common buckthorn occasional in the understorey, and goldenrod, riverbank grape and Virginia creeper in the ground layer.
Swamp (SW)	
SWM3-2 Poplar-Conifer Mineral Mixed Swamp	Offsite Torrance Creek PSW dominated by trembling aspen with eastern white cedar as an associate in the canopy. The sub-canopy is dominated by eastern white cedar with glossy buckthorn dominant in the understorey. The ground layer was dominated by various fern species (e.g., sensitive fern).
Marsh (MA)	
MAM2-2 Reed-canary Grass Graminoid Mineral Meadow Marsh	Meadow marsh dominated by reed canary grass with occasional cattails.
MAS2-1 Cattail Mineral Shallow Marsh	Offsite Hanlon Creek PSW dominated by cattails, with occasional white elms in the canopy.

4.4.2 Vascular Plant Species

A complete list of vascular plant species recorded on the Subject Property during botanical, ELC, and tree surveys is included in **Appendix I1**. A total of eighty-five (85) species of vascular plants were recorded in the Study Area. This total includes taxa identified to species, subspecies (ssp.) and variation (var.) levels. Forty-seven (47) of the 85-recorded species (55%) are native to Ontario, while the other 38 (45%) are exotic species not native to Ontario. Forty percent (40%; 34) of these species have a provincial rank of S5, indicating they are common with a secure population, 7% (6) were ranked as S4, indicating they are uncommon but not rare and populations are apparently secure in Ontario. Two species, honey locust and butternut, have provincial ranks between S1 and S3, indicating they are rare in Ontario.

Native species identified had a coefficient of conservatism value of 6 or lower indicating a moderate to low sensitivity to habitat disturbance, with the exception of tamarack, which has a coefficient of conservation of 7, indicating it has a high sensitivity to habitat disturbance. Tamarack was recorded by NRSI during the tree inventory, identified within the western hedgerow associated with 9 Valley Drive.

A total of six individual trees of one SAR, butternut, was documented on the Subject Property, as shown on **Figure 4** (**Appendix A**). Butternut is provincially ranked S3? (possibly vulnerable) and provincially Endangered. This medium-sized tree is commonly found in a variety of habitats throughout Southern Ontario, including woodlands and hedgerows in rich, moist, and well-drained soils often along streams, but may also be found on well-drained gravel sites, particularly those made of limestone (COSEWIC 2017). This tree is also considered locally significant in the City of Guelph.

A sample from butternut (tree 327) identified on the Subject Property (see **Figure 4, Appendix A**) was sent to for genetic testing, which did not identify any traces of hybridity. Lab paperwork is provided in **Appendix J**. Butternut is further discussed in **Section 5.4.1**, below.

Three individual honey locust trees, provincially rare in the province (S2), were also documented on the Subject Property, as shown on **Figure 4** (**Appendix A**). Based on the location of these trees, in a cluster along a property boundary, it is possible that these species were planted as hedgerow trees by previous landowners.

One Black Maple tree was record on site by NRSI.

Butternut and black maple are locally significant in the City of Guelph and are also shown on **Figure 4** (**Appendix A**).

4.4.3 Wetland Delineation

The extent of the Torrance Creek PSW boundary as determined in the field with the GRCA and City of Guelph in 2019 is shown on **Figure 3** (**Appendix A**)**.**

4.4.4 Woodland Delineation

The extent of the woodland boundary as determined in the field by NRSI with the City of Guelph in July 2014 and confirmed in October 2017 is shown on **Figure 3** (**Appendix A**)**.**

4.4.5 Tree Preservation Plan

A total of 707 trees were inventoried by NRSI during the preparation of the Tree Preservation Plan, found in **Appendix F.** Nine species were documented on the Subject Property, with the majority of the trees documented as native species (67%) and 33% non-native species. Several eastern white cedar hedgerows are present, as well as a hedgerows comprised of Freeman’s maple and Norway spruce.

4.4.6 Amphibian Survey and Habitat Assessment

Results of the spring amphibian call survey and habitat assessment did not identify any calling amphibians nor suitable areas of vernal pooling to support amphibian breeding habitat.

No amphibians were observed during the amphibian habitat assessment in the PSW but one wood frog (July 5, 2018) and one gray tree frog (May 16, 2019) were observed incidentally during other field investigations.

4.4.7 Bat Habitat and Exit Surveys

4.4.7.1 Bat Habitat Assessment

The bat maternity roost habitat assessment of the Subject Property identified four buildings and eleven isolated trees (i.e., trees not located within forested areas) with characteristics that could potentially support bat maternity roosting (**Figure 2, Appendix A**). Isolated trees were primarily associated with 1260 Gordon Street or the edge of the deciduous forest.

4.4.7.2 Bat Exit Survey

Results of the bat exit surveys did not confirm bat use at any of the surveyed potential roost trees. However, bats were observed exiting the abandoned residence located at 9 Valley Road, identified as Big Brown Bats through the analysis of the data recorded by the hand-held acoustic equipment. Low numbers of calls belonging to bat SAR (Little Brown or Northern Myotis) were recorded around from monitors placed near the houses and roost trees along Gordon Street.

Acoustic data collected from the scotch pine plantation (CUP3-3; SM3-08, **Figure 2, Appendix A**) recorded the highest level of bat activity on the Subject Property, recording thousands of calls. Of those calls, a small percentage (10-20 individual recordings, total) belonged to one of the two *Myotis* bat SAR (Little Brown or Northern Myotis).

Of the detectors deployed in the cedar forest (FOC2-2; SM3-10, SM3-02; **Figure 2 Appendix A**) 30-40recordings of SAR were made. Considerations for the project for bat SAR are discussed further in **Section 5.4.3.**

4.4.8 Breeding Bird Surveys

4.4.8.1 Diurnal Surveys

During breeding bird surveys conducted in June 2018, Stantec observed 20 species of birds, 18 of which are likely to be breeding in the Study Area. Mallard is not expected to be breeding in the Study Area as it was observed flying over during surveys. One species, Barn Swallow, is not expected to be breeding on the Subject Property based on a search of onsite buildings but may be in the Study Area.

A complete list of birds observed during the surveys is provided in **Appendix I2**. All species observed are ranked S5 (Secure; common and widespread), or S4 (Apparently secure; uncommon but not rare). One SOCC and one SAR were identified during avian field studies, Eastern Wood-Pewee (Special Concern) and Barn Swallow (Threatened). Their locations are shown on **Figure 4** (**Appendix A**) with Barn Swallow discussed further in **Section 5.3.5.**

Four locally significant bird species were identified in the Study Area according to the City of Guelph's *Locally Significant Species List* (City of Guelph 2012). This includes: Barn Swallow, Eastern Wood-Pewee, Northern Flicker and Hairy Woodpecker, as shown on **Figure 4** (**Appendix A**).

4.4.8.2 Crepuscular Surveys

Common Nighthawks were not identified during surveys conducted in June 2019 on the Subject Property.

4.4.9 Woodland Raptor Nest Survey

No raptor nests were identified within the Subject Property or Study Area where access was permitted.

4.4.10 Terrestrial Crayfish Survey

Stantec did not observe any evidence of terrestrial crayfish within the Subject Property during surveys.

4.4.11 Snake Habitat Assessment

Suitable habitat to support snake hibernacula was not identified on the Subject Property.

4.4.12 Wildlife Movement Study

The deployed wildlife cameras photographed a total of 178 animals of three species. White-tailed Deer was the most common species, with 158 records, with Coyote and Gray Squirrel also recorded. Most observations (75%) were recorded at camera locations 4 and 5 (**Figure 2**, **Appendix A**). Based on this, it appears that most of the wildlife movement, particularly White-tailed Deer, is through the cultural meadow in the center of the Subject Property (CUM1-1; **Figure 2**, **Appendix A**). Individuals were recorded at all hours of the day, with 71% recorded in the evening/overnight hours (between 6:00 pm and 6:00 am).

A total of 158 photos of White-tailed Deer were recorded, the actual number of deer using the Subject Property is unknown as it is likely that individuals were recorded multiple times. Of the 158 camera passes, thirty-one (31) were of bucks during the monitoring period. Photograph quality was limited, however; review of the 31 photos identified at least 5 different bucks based on antler pattern.

4.4.13 Butterflies, Dragonflies, and Bees

Seven butterfly, five dragonfly species, and three bees were observed on the Subject Property. All native species observed were ranked S5 (very common and secure in Ontario) or S4 (common and apparently secure in Ontario). Most observations were within the onsite cultural meadow (CUM1-1) likely due to the presence of exotic flowering plants and open sunny areas.

Two Monarch butterflies were observed during the August 15, 2018 survey, as shown on **Figure 4** (**Appendix A**). The Monarch is ranked S4 (common and apparently secure in Ontario) and is considered a provincial species of Special Concern.

A complete list of species observed is provided in **Appendix I2**

4.4.14 Incidental Wildlife Observations

Incidental wildlife observations documented two additional mammal species (Eastern cottontail and red squirrel), two bird species (Yellow-billed Cuckoo and Pileated Woodpecker), two reptile species (Eastern gartersnake and red-bellied snake), and two amphibian species (wood frog and gray treefrog).

A full wildlife list of species observed on the Subject Property is provided in **Appendix I2.**

5.0 SIGNIFICANT NATURAL HERITAGE FEATURES

The following analysis of significance targets development constraints recognized by the Natural Heritage Policy (Section 2.1) of the PPS (OMAH 2014) on the following natural heritage features:

- Significant Wetlands
- Significant Woodlands
- Significant Wildlife Habitat
- Significant Habitat for Endangered and Threatened species

Each of these components and their applicability to the Study Area is discussed in the following sections.

5.1 SIGNIFICANT WETLANDS

The province determines significance of wetlands according to standardized evaluation procedures. Additionally, the planning authority may designate other wetlands significant if they have limited representation within the planning area or are of high quality within the context of the municipality.

According to LIO mapping (2020b), two PSWs are located within 120 m of the Subject Property: the Torrance Creek and Hanlon Creek PSW Complexes (**Figure 1, Appendix A**). The boundary of the Torrance Creek PSW in proximity to the Subject Property was updated with the GRCA in 2019 and is shown on **Figure 3** (**Appendix A**). The staked boundary is relatively consistent with LIO mapping, expanding the wetland along the northern half of the delineated area. The Hanlon Creek PSW, separated from the property by Gordon Street was not updated during the review.

The City of Guelph OP Schedule 4A identified the white cedar forest (FOC2-2; **Figure 3**, **Appendix A**) as locally significant wetland. Based on the results of the wetland staking with the GRCA an update to the OP mapping is recommended, in accordance with General Policy 4.2.1 (2) that permits mapping updates to the Natural Heritage System through detailed studies completed as part of an EIS.

5.2 SIGNIFICANT WOODLANDS

Significant Woodlands in the City of Guelph are identified on Schedule 4C of the OP and are defined in Section 4.1.3.6 of the Official Plan:

- woodlands ≥1ha not identified as cultural woodlands or plantations
- woodlands ≥0.5ha consisting of Dry-Fresh Sugar Maple Deciduous Forest
- any woodlands ranked S1-S3 by the NHIC.

The forested portion associated with the Torrance Creek PSW (i.e., FOC2-2 and SWM3-2; **Figure 3**, **Appendix A**), adjacent deciduous forest (FOD5-6) and, notwithstanding the criteria denoted in the OP excluding plantations, two contiguous plantations (CUP3 and CUP3-3) are designed as Significant Woodland on Schedule 4C of the City's Official Plan. The significant woodland boundary was delineated in the field by NRSI with the City of Guelph in 2014 and 2017, which appears to follow the OP designation, as shown on **Figure 3**, **Appendix A**.

No other woodlands in the Study Area are designated significant by the City.

5.2.1 Other Woodlands

One deciduous woodland (WODM4-4), comprised of regenerating black walnut, is present on the Subject Property but is not included as part of the Significant Woodland due to composition, origin, and size.

5.3 SIGNIFICANT WILDLIFE HABITAT

SWH includes the following categories as defined in the *Significant Wildlife Habitat Technical Guide:*

- seasonal concentration areas
- rare vegetation communities or specialized habitat for wildlife
- habitat for species of conservation concern
- wildlife movement corridors.

The Significant Wildlife Habitat Technical Guide (MNR 2000) and SWH Criteria Schedule for Ecoregion 6E (MNRF 2015) were consulted to identify candidate and, where required, confirm SWH. Specialized forms were completed in the field for each vegetation community, found in **Appendix H**, to document rare or specialized features and candidate habitat types. Targeted field studies were undertaken to confirm candidate SWH types identified in the ToR (**Appendix C**), the results of which are summarized in **Section 4.4.** Details of the SWH assessment is summarized below.

5.3.1 Seasonal Concentration Areas

Seasonal concentration areas are sites where large numbers of a species or where several species gather together at one time of the year. Not all concentration areas are significant, only the best examples are typically designated as SWH. The background review and field investigations identified the potential for two types of candidate seasonal concentration areas to occur on the Subject Property and the Study Area: bat maternity colonies and deer wintering areas. Additionally, turtle wintering areas may be present in the Study Area within either of the PSWs but was not confirmed in the field due to a lack of access. An analysis of candidate seasonal concentration areas by type is provided in **Table 5.1**.

Table 5.1: Summary of Seasonal Concentrations Areas within the Subject Property and Study Area

Habitat Type	Habitat Features	Presence / Absence within the Subject Property and Study Area
Waterfowl stopover and staging areas	Field with evidence of annual spring flooding from meltwater or runoff; aquatic habitats such as ponds, marshes, lakes, bays, and watercourses used during migration, including large marshy wetlands	Absent
Shorebird migratory stopover area	Beaches and un-vegetated shorelines of lakes, rivers, and wetlands	Absent
Raptor wintering areas	Combination of fields and woodland (>20 ha)	Absent
Bat hibernacula	Abandoned mine shafts, underground foundations, caves, and crevices	Absent
Bat maternity colonies	Mixed and deciduous forests and swamps with large diameter dead or dying trees with cavities	**Potentially present in significant woodland in the Study Area.**
Turtle wintering area	Permanent waterbodies and large wetlands with sufficient dissolved oxygen	Potentially present in the Study Area.
Reptile hibernacula	Rock piles or slopes, stone fences, crumbling foundations	Absent
Colonially – nesting bird breeding habitat (bank and cliff)	Eroding banks, sandy hills, steep slopes, rock faces or piles	Absent
Colonially – nesting bird breeding habitat (trees/shrubs)	Dead trees in large marshes and lakes, flooded timber, and shrubs, with nests of Great Blue Heron, Great Egret, Green Heron, or Black-crowned Night-Heron	Absent
Colonially – nesting bird breeding habitat (ground)	Rock islands and peninsulas in a lake or large river	Absent
Migratory butterfly stopover area	Fields and forests that are a minimum of 10 ha and are located within 5 km of Lake Erie or Lake Ontario	Absent
Landbird migratory stopover area	Woodlands of a minimum size located within 5 km of Lake Erie or Lake Ontario	Absent
Deer wintering congregation areas	Deer yards are mapped by MNRF	**Present in wooded areas within the Subject Property and Study Area as identified on MNRF LIO mapping.**

5.3.2 Rare or Specialized Habitat

Rare habitats are vegetation communities that are considered rare (S1-S3) in the province. These habitats are generally at risk and may support wildlife species that are significant due to their rarity. Alternatively, specialized habitats are microhabitats that are critical to certain wildlife species. Candidate rare or specialized habitats are identified by type in **Table 5.2**. The background review and field investigations identified three potential rare or specialized habitats within the Study Area, as outlined below. No rare or specialized habitats were confirmed as SWH on the Subject Property.

Table 5.2: Summary of Rare or Specialized Habitat within the Subject Property and Study Area

Habitat Type	Habitat Features	Presence / Absence within the Subject Property and Study Area
Rare Vegetation Communities		
Sand barren, alvar, cliffs and talus slopes	Sand barren, Alvar, Cliff and Talus ELC Community Classes, and other areas of exposed bed rock and patchy soil development, near vertical exposed bedrock and slopes of rock rubble	Absent
Prairie and savannah	Open canopy habitats (tree cover < 60%) dominated by prairie species	Absent
Old growth forest	Relatively undisturbed, structurally complex; dominant trees > 100 years' old	Absent
Other rare vegetation communities	Vegetation communities ranked S1-S3 by the NHIC	Absent
Specialized Habitats		
Waterfowl nesting areas	Upland habitats adjacent to wetlands (within 120 m)	Absent
Bald Eagle and Osprey nesting, foraging and perching habitat	Treed communities adjacent to rivers, lakes, ponds, and other wetlands with stick nests of Bald Eagle or Osprey	Absent
Woodland raptor nesting habitat	Forested ELC communities >30ha with 10 ha of interior habitat	Potentially present in the Study Area
Turtle nesting areas	Exposed soil, including sand and gravel in open sunny areas in proximity to wetlands	Absent
Seeps and springs	Any forested area with groundwater at surface within the headwaters of a stream or river system	Potentially present in the Study Area
Amphibian breeding habitat (woodland and wetland)	Treed uplands with vernal pools, and wetland ecosites	Absent
Woodland area sensitive breeding bird habitat	Large mature forest stands, woodlots >30 ha	Potentially present in the Study Area

5.3.3 Species of Conservation Concern

Habitat for SOCC includes four types of species: those that are rare, those whose populations are significantly declining, those that have been identified as being at risk to certain common activities, and those with relatively large populations in Ontario compared to the remainder of the global population.

Candidate habitats for SOCC are identified in **Table 5.3.** The background review and field investigations identified candidate habitat for terrestrial crayfish and habitat for six (6) SOCC within the Study Area.

Table 5.3: Summary of Habitat for Species of Conservation Concern within the Subject Property

Habitat Type	Habitat Features	Presence / Absence of Rare or Specialized Habitat within the Subject Property and Study Area
Open country bird breeding habitat	Large grasslands and fields (>30 ha)	Absent
Shrub/early successional bird breeding habitat	Large shrub and thicket habitats (>10 ha)	Absent
Marsh bird breeding habitat	Wetlands with shallow water with emergent aquatic vegetation	Absent
Terrestrial Crayfish	Wet meadows and edges of shallow marshes	Potentially present in the Study Area
Special Concern and provincially rare wildlife (as identified in Table 3-1)	Habitat for Special Concern species:	Present.
	1. Common Nighthawk: Open habitats with gravel substrate	Species absent during targeted surveys.
	2. Eastern Wood-Pewee: Deciduous and mixed forests	Species observed within the Subject Property (FOC2-2 community) during field investigations. Habitat present within the Study Area.
	3. Red-headed Woodpecker: Deciduous and riparian forests, orchards, parks, grasslands	Species absent during targeted studies.
	4. Snapping Turtle: Ponds, sloughs, streams, rivers, and shallow bays	Habitat absent within the Subject Property. Habitat present within the Study Area.
	5. Wood Thrush: Deciduous and mixed forests	Species absent during targeted studies.
	6. Monarch: Milkweed and wildflowers	Subject Property provides foraging habitat for Monarchs (e.g., goldenrods, asters, clover; COSWEIC 2016) but was lacking suitable host plant species (milkweed; COSEWIC 2016).

Table 5.3: Summary of Habitat for Species of Conservation Concern within the Subject Property

Habitat Type	Habitat Features	Presence / Absence of Rare or Specialized Habitat within the Subject Property and Study Area
		The observation of a couple Monarchs in an area where host plants are lacking is not considered to constitute SWH for Monarch. SWH is considered **absent** from the Subject Property and Study Area.

5.3.4 Wildlife Movement Corridors

Wildlife movement corridors are passageways that are used by wildlife to move between habitats, typically in response to different seasonal habitat requirements. Movement corridors are identified once significant amphibian breeding habitat and deer wintering habitat has been confirmed.

Candidate animal movement corridors are identified in **Table 5.4**. The MNRF identified deer wintering habitat on the Subject Property with the associated deer movement corridor identified by the City of Guelph OP within the Study Area, as shown on **Figure 4, Appendix A**. Amphibian breeding habitat was not identified in the Study Area and therefore amphibian movement corridors are also absent.

Table 5.4: Summary of Wildlife Movement Corridors

Habitat Type	Habitat Features	Presence / Absence of Wildlife Movement Corridors within the Subject Property
Deer movement corridors	Associated with confirmed deer wintering habitat/area	• **Confirmed on Subject Property** • **Others identified in the City of Guelph OP (2018)**
Amphibian movement corridors	Associated with confirmed amphibian breeding habitat	Absent

5.3.5 Locally Significant Species

Six locally significant wildlife species were identified within the Study Area during field studies undertaken on the Subject Property:

- Five bird species: Barn Swallow, Eastern Wood-Pewee, Hairy Woodpecker, Pileated Woodpecker, Yellow-billed Cuckoo
- One reptile: Red-bellied Snake.

- The locations of these species, and the two locally significant plant species, are shown on **Figure 4** (**Appendix A**).

5.4 HABITAT OF ENDAGERED AND THREATENED SPECIES

The protection of endangered and threatened species and their habitats in the province is currently administered by the MECP under the ESA (2007). Prior to April 1, 2019 the MNRF was the administrator of the ESA, who were consulted in 2018 and identified the potential for Snapping Turtle within the Study Area in their July 12, 2018 response (**Appendix B2**). Habitat assessments for Snapping Turtle, and SAR known to potentially occur within the Study Area were completed during field studies. Four (4) species protected under the ESA were identified on the Subject Property and/or in the Study Area.

5.4.1 Butternut

Six butternut trees were identified on the Subject Property by NRSI during the tree inventory, as shown on **Figure 4** (**Appendix A**). Butternut is provincially ranked S3? (possibly-vulnerable); and is considered endangered provincially and federally. Butternut is afforded habitat protection under the ESA (2007), which includes a 25 m buffer to protect the tree from root damage.

To facilitate the proposed development and the removal of 3 of the 6 trees, it is anticipated that Tricar will pursue an exemption under Ontario Regulation 242/08 Section 23.7 following the completion of a butternut health assessment undertaken by a qualified surveyor.

5.4.2 Barn Swallow

Barn Swallow was observed flying through the cultural plantation (CUP3) on the Subject Property and likely foraging over the cultural meadow (CUM1). Barn Swallow is ranked as S4B provincially (apparently secure breeding status rank) and is designated a provincially and federally threatened species. This species is afforded general habitat protection under the ESA (2007).

As their name suggests, Barn Swallows nest on walls or ledges of barns as well as on other human-made structures such as bridges, culverts or other buildings (Cadman et al. 2007). Where suitable nesting structures occur, Barn Swallow often form small colonies, sometimes mixed with Cliff Swallows. Barns Swallows feed on aerial insects while foraging in open habitat (COSEWIC 2011a). Barn Swallows are generally considered grassland species, foraging over meadows, hay, pasture or even mown lawn. They will also frequently forage in woodland clearings, over wetland habitats or open water where insect prey are abundant.

Human-made structures on the Subject Property included four residences and associated outbuildings as well as a small shed located in the woodland. Structures on the Subject Property were examined and do not provide nesting habitat for Barn Swallow.

5.4.3 Bat SAR

Little Brown, Northern Myotis, and Tri-colored bat are listed as Endangered in Ontario. These species use forested habitats for maternity colonies and roosting during their active season (approximately April 1-September 30) and as such impacts to these areas may constitute contravention of the ESA (2007). Bat SAR were documented within the significant woodland during field studies, however; the proposed development is sited outside of this area and thus impacts to bat SAR within the significant woodlot is not anticipated. Bat exit surveys were completed of the residence to be removed and a maternity roost of Big Brown Bats was observed based on analysis of acoustic recording. In addition, roost surveys completed of snag trees in the development footprint revealed no evidence of bat roosts in the surveyed locations. SAR bats where noted in acoustic recordings on the property where bats were noted to be foraging, these bats are considered to be roosting within Significant Woodland portion of the Subject Property and Study Area.

The proposed development includes the removal of hedgerows and trees associated within the onsite residences (606 trees; **Appendix F**). There are no maternity roosts in the tree removal areas of the Subject Property.

5.5 SIGNIFICANT NATURAL HERITAGE FEATURES SUMMARY

In summary, significant natural heritage features identified on the Subject Property and/or Study Area include:

- Hanlon Creek and Torrance Creek PSW (MAS2-1, SWM3-2)
- Significant Woodlands (SWM3-2, FODM6-5, CUP3, CUP3-3)
- SWH
    - deer wintering congregation areas (SWM3-2, FOC2-2)
    - special concern and provincially rare wildlife (Eastern Wood-Pewee)
    - deer crossing and ecological corridor (City of Guelph OP)
- habitat of Endangered and Threatened Species (butternut)
- provincially rare plants (honey locust)
- habitat for locally significant wildlife (Barn Swallow, Eastern Wood-Pewee, Hairy Woodpecker, Pileated Woodpecker, Yellow-billed Cuckoo, Red-bellied Snake) and plants (butternut, black maple).

Although we were unable to confirm presence/absence, candidate SWH was identified in the Study Area, including:

- bat maternity colonies (SWM3-2, FOD5-6)
- turtle wintering area (SWM3-2)
- woodland raptor nesting habitat (SWM3-2)
- seeps and springs (SWM3-2)
- woodland area sensitive breeding bird habitat (SWM3-2)
- terrestrial crayfish

- special concern and provincially rare wildlife (Snapping Turtle).

Finally, the following non-significant natural heritage features were found in the Study Area:

- other woodlands (WODM4-4).

6.0 PROPOSED DEVELOPMENT

Tricar is proposing to construct two 12-storey residential buildings, one fronting on Gordon Street and one adjacent to the southwest boundary of the Subject Property, as shown on **Figure 5** (**Appendix A**). Surface and underground parking, stormwater management infiltration galleries, and internal roadways are proposed to service the development. A park block is also included in the proposed development.

6.1 STORMWATER MANAGEMENT

Stormwater management criteria were established based on the following documents:

- *Development Engineering Manual, City of Guelph* (City of Guelph Engineering and Transportation Services 2019)
- *Geotechnical Investigation, Two 12-Storey Apartment Buildings 1242, 1250, 1260 Gordon Street, Guelph Ontario* (XCG Consulting Limited 2018)
- *Low Impact Development Stormwater Management Planning and Design Guide* (Credit Valley Conservation Authority and Toronto and Region Conservation Authority 2010)
- *Stormwater Management Planning and Design Manual (SWMPD Manual) (*MOE 2003)
- *Torrance Creek Subwatershed Study- Management Strategy* (Totten Sims Hubicki Associates, et al. 1998)
- *Hanlon Creek Watershed Plan* (Marshal Macklin Monaghan Ltd., LGL Ltd. 1993)

Based on an analysis of the above documents, including review of the GRCA's recharge rates, Stantec determined that the application of the Torrance Creek Subwatershed Study criteria was appropriate for the proposed development. Stormwater management criteria for the Subject Property are as follows:

- attenuate post-development peak flows to pre-development rates for the 2-year through 100-year storm events
- infiltrate, evaporate, or reuse 150 mm/year
- minimum of Enhanced Water Quality Protection.

Stormwater runoff will be provided with water quantity control by a combination of rooftop controls over both the west and east building and a subsurface storage tank located in the underground parking structure at the north section of the development.

The rooftop controls will provide flow attenuation to both building areas, with rooftop controls directing attenuated flows into a downspout system that are connected to an onsite infiltration (rock) trench. A flow splitting device will send the 25 mm flows to the infiltration trench, with larger flows being directed to the Gordon Street storm sewer. This feature will promote infiltration of the rooftop runoff to the groundwater system, with overflows backing up to a subsurface storage tank and ultimately out-letting to the Gordon Street storm sewer.

A storm sewer system will convey collected runoff to the onsite infiltration (rock) trench. This feature will promote infiltration of the runoff to the groundwater system, with overflows backing up to the subsurface tank. A 75 mm orifice control will be provided on the downstream end, prior to discharge to the Gordon Street storm sewer. The total flow to Gordon Street (inclusive of rooftop-controlled flow) meets the predevelopment target rates.

The infiltration trench will be located along the east portion of the development. By infiltrating the first 25 mm of every storm event, it is expected that enhanced level protection (80% Total Suspended Solids [TSS] removal) will be provided, in accordance with City of Guelph standards. The trench was sized to draw-down within 48 hours after roof-top ponding.

The infiltration trench consists of the following components:

- surface area of 672 m^2
- assumed subsurface soil infiltration rate of 7 mm/hour - which was deemed to be a conservative estimate
- infiltration gallery 0.96 m deep (filled with clearstone) with sides wrapped in filter fabric.

A treatment train approach to water quality includes an Oil-Grit Separator (OGS) upstream of the infiltration trench and catch basin shields will also be provided onsite. Full stormwater management details are provided in the FSR (**Appendix G**).

6.1.1 Water Balance and Infiltration

A pre- and post-development water balance assessment was completed for the Subject Property (Section 5.0 of **Appendix E**), with the analyses indicating the following:

- Under the pre-development condition, the predicted annual infiltration volume for Catchment 101 (drains westward towards Gordon Street) is 1,977 m^3, equating to a rate of 175 mm/year. For Catchment 102 (which drains eastward towards Torrance Creek PSW), the annual pre-development infiltration volume is 3,252 m^3, equating to a rate of 188 mm/year. Overall, the annual infiltration rate for the Subject Property is estimated to be 5,229 m^3, equating to a rate of 183 mm/year. These infiltration rates fall within the 100 mm/year to 200 mm/year groundwater recharge rate range reported for the Site by the GRCA.
- Under the post-development condition, impervious surfaces are expected to cover 88% of the former Catchment 101 and 17% of the former Catchment 102, resulting in annual infiltration volumes of 203 m^3 and 2,748 m^3 via the remaining onsite pervious areas, respectively. Annual infiltration deficits for former Catchments 101 and 102 are estimated to be 1,774 m^3 and 504 m^3, respectively, for a combined annual deficit of 2,278 m^3.

To address the previously mentioned infiltration deficit, the post-development Low Impact Development (LID) infiltration strategy proposed for the Subject Property will involve the construction of an onsite infiltration (rock) trench as described above in **Section 6.1**. This trench will be sized to infiltrate a 25 mm storm event, resulting in an infiltration volume of 323 m^3 for each such storm event. As per historical climate records, on average there are approximately five days a year where storm events total 25 mm, equating to a total volume of 1,615 m^3 that will be directed to the infiltration gallery and, subsequently, mitigate roughly 78% of the projected annual infiltration deficit from these storm events alone. Given that there are on average a total of 84 days where precipitation totals will range from 5 mm up to 25 mm, it is reasonable to conclude that the proposed LID strategy (i.e., rock trench) will more than mitigate the remaining annual infiltration deficit for the Site.

6.1.2 Trail

The Guelph Trail Master Plan includes a proposed trail connection through the Subject Property, connecting Arkell Road to the south to Kortright East to the north. The proposed alignment goes through the significant woodlot on the Subject Property and outside of the current project development footprint. It is recommended that the trail be completed as part of a broader trail design approach to avoid a disconnected trail system. The City will obtain ownership of the woodlot and the proposed park block, and as such connections from the park through the woodlot can be determined through a coordinated approach. This will allow the City the opportunity to lead a public process for determining the best use for the park and as therefore is better completed outside of this application.

7.0 POTENTIAL IMPACTS OF DEVELOPMENT AND MITIGATION RECOMMENDATIONS

Potential direct and indirect impacts on adjacent natural features that might reasonably be expected to occur because of the proposed development are discussed below. Recommended mitigation measures have been provided with an overall net environmental impact assessment, assuming that appropriate mitigation and enhancement measures are implemented where feasible.

7.1 IMPACTS ON SIGNIFICANT NATURAL FEATURES

Potential impacts associated with the development include an increase in impervious surface cover, resulting in impacts to the hydrologic cycle through reduced recharge and increased runoff from these surfaces. In addition to the increased runoff, this additional water may carry nutrient, biological, or sediment load. Encroachment issues such as ad-hoc trails, refuse dumping, garden escapees can also degrade adjacent natural features.

Construction impacts including sedimentation and erosion, encroachment outside of the development footprint, and direct (i.e., mortality) or indirect (i.e., noise, barriers to movement) impacts to wildlife may also occur, although they are expected to be short-term.

Feature-specific impacts are described below with mitigation measures presented in **Section 7.3**.

7.1.1 Significant Wetlands

No development is proposed in or within 30 m of any wetlands. Both PSWs are separated from the proposed development by approximately 100 m and a major roadway (Gordon Street) or approximately 70 m and upland forests (FOD5-6, FOC2-2). Incidental runoff impacts associated with sediments, dust, as well as nutrient loads will be reduced by the natural polishing function of the vegetative zone between the feature and development. In addition, all surface runoff from the proposed development is directed to the existing storm sewer on Gordon Street.

Potential impacts to the Hanlon Creek and Torrance Creek PSWs (MAS2-1, SWM3-2) during and post-construction include:

  - increased biological contamination (e.g., invasive species)
  - encroachment (i.e., ad-hoc trails, lawn and garden waste dumping, garden escapees)
  - changes in groundwater infiltration.
- Stantec notes that the post-development LID infiltration strategy will match and likely notably exceed pre-development infiltration volumes within the catchment that directs flows to the Torrance Creek Swamp (see **Section 6.1.1**) and, consequently, no detrimental effects to the existing hydrogeological relationship between the groundwater system and the Torrance Creek PSW is expected.

- Although an infiltration deficit expected to occur in the portion of the Subject Property where groundwater flows westward towards the Upper Hanlon Creek Watershed, the velocity at which groundwater flows beneath the subsurface deposits of this portion of the property is at a rate of 0.52 m/year (i.e., 1 m every 1.9 years). As such, it is reasonable to assume that under predevelopment conditions, groundwater flow volumes originating from beneath the Subject Property are unlikely to factor into the maintaining of the water regime associated with this PSW (and this assumes that this wetland is even characterized by groundwater discharge conditions, which local GRCA mapping indicates that the wetland near the Subject Property is not). Consequently, the predicted reduction of infiltration in the southwest portion of the Subject Property is not expected to cause a detrimental effect to the existing hydrogeological form or function of the Hanlon Creek PSW.

7.1.2 Significant Woodlands

The significant woodlands associated with the Torrance Creek PSW may experience the following impacts:

- decreased surface water contributions
- increased sediment and herbicide/pesticide load
- increased biological contamination (e.g., invasive species)
- encroachment (i.e., ad-hoc trails, lawn and garden waste dumping)
- construction impacts (dust, encroachment).

As noted previously surface water will be directed to infiltration galleries or storm water sewers. The woodland may receive occasional overflow of surface water during heavy storm events; however, the volume of residual sediment or chemicals during storm events would be diluted and the woodland would act as a polishing receptor for these residual materials. The existing onsite overland flow is minimal and supporting water to the woodlands is primarily from direct precipitation.

7.1.3 Other Woodlands

The WODM4-4 community (**Figure 2, Appendix A**) is planned for removal as part of the development proposal. Mitigation measures to avoid impacts to wildlife during removal of this woodland are discussed in **Sections 7.3**.

7.1.4 Significant Wildlife Habitat

Potential impacts to wildlife and wildlife habitat include direct impacts (e.g., mortality, loss of habitat) and indirect impacts (e.g., noise disturbance, degradation of habitat). Impacts to SWH identified on the Subject Property or within the Study Area are detailed below.

Development is sited outside and setback from the Significant Woodlot and PSW, which protects SWH for potential bat maternity roosts (including SAR, discussed in **Section 5.4**), overwintering deer and turtles, nesting woodland raptors and area-sensitive breeding birds, seeps and springs, terrestrial crayfish, and special concern and provincially rare wildlife (Eastern Wood-Pewee, Snapping Turtle).

Results of the movement study (detailed in **Section 4.4.12**) identified White-tailed Deer movement primarily through the open portion of the Subject Property (CUM1, cameras 4 and 5; **Figure 2**, **Appendix A**). Individuals were recorded at all hours of the day, with 71% recorded in the evening/overnight hours (between 6:00pm and 6:00am). Although we cannot conclude if photographed deer went on to cross Gordon Street or if movement was simply internal to the Subject Property, two deer crossing locations of Gordon Street were identified in the Study Area by the City of Guelph OP, shown on **Figure 4**, **Appendix A**. It should be noted that deer tracks were not observed during several site visit at the front of the property near Gordon suggesting that deer movement across Gordon was limited during the recent study period.

The two deer crossing locations identified in the Study Area on the City of Guelph OP are based on data from field observations, City planning staff known vehicle-deer accident locations, as well as citizen science identified during consultations in 2008 (Dougan & Associates 2009). Of the two crossing locations, it is our opinion that deer crossing from the Subject Property to the south side of Edinburgh Road into the Hanlon Creek PSW (Crossing B; **Figure 1**, **Appendix A**) is not anticipated to be the primary crossing location in this area because the Hanlon Creek PSW does not provide protective tree cover once deer cross to the west side of Gordon Street. At this crossing location, the PSW is an open marsh as opposed to Crossing A which is in proximity to a treed area.

Significant changes in the intensification of Gordon Street, in proximity to Arkell Road, have occurred since 2009. Deer movement patterns resulting from these previous changes have likely occurred and are anticipated to occur after development of the Subject Property. It is anticipated that the southern crossing (Crossing A; **Figure 1**, **Appendix A**) will be favoured post-development. In addition to being noted as a deer crossing location, this area was also designated as an ecological linkage by the City of Guelph in their OP. The shift in deer movement is anticipated to maintain connectivity across Gordon Street for the following reasons:

- Deer are highly mobile animals (e.g., Alverson et al., 1988; Gaughan and DeStefano, 2005, etc.) and as such are not expected to be at risk of fragmentation effects nor direct impact during construction.
- Gordon Street is a 4-lane transportation artery in the City of Guelph with existing impacts to local deer populations. These impacts include disturbance to the species due to high volumes and continuous traffic on Gordon Street and the potential for direct impacts through road mortalities.
- The anticipated reduced traffic flow from 6 pm until 6 am on Gordon Street corresponds to when deer movement across the Subject Property was highest. White-tailed deer are crepuscular, browsing mainly at dawn and dusk), placing them at lower risk of traffic impact disturbance.
- As southern populations of deer are known to conditionally migrate (Sabine et al., 2002), it is possible that deer in proximity to the Subject Property are conditionally migratory due to a more temperate climate than elsewhere in its range. Therefore, a resident population of deer in the PSW may exist year-round, increasing to some degree in winter, but a mass migration of deer between the Torrance Creek and Hanlon Creek PSW is likely not occurring pre (or post) construction.
- The primary limiting factor for deer in the northeastern part of their range in North America is density dependent foraging competition (Messier 1991; Post and Stenseth, 1998; Dumont *et al.*, 2000; Patterson and Power 2002; as cited in Patterson *et al.*, 2002), which is not expected to change post-

construction. Shrubby edge vegetation will persist, with the potential for additional plantings (i.e., food) to be provided post-construction.

- No impact is expected on the form or function of the woodland or PSW and therefore the quality of the overwintering deer habitat will not change post-construction. Maintenance of this habitat is key to continue to draw and provide habitat all year for deer.

7.1.5 Significant Habitat of Endangered and Threatened Species

Three SAR were noted on or using the Subject Property, including SAR bats (foraging), Barn Swallow (foraging), and Butternut trees.

Through extensive onsite surveys, no SAR bat roosting habitat was identified on the Subject Property. Generally foraging habitat for bats is not protected and an abundance of foraging habitat remains in the protected Significant Woodland and the communities of both the adjacent Torrance Creek and Hanlon Creek PSWs. Precautionary mitigation measures are discussed below.

Butternut trees that will be removed or within 25 m impact zone will be replaced as per Ontario Regulation 242/08 of the ESA.

7.1.6 Locally Significant Species

The six locally significant species identified on **Figure 5** (**Appendix A**) were observed outside of the proposed development footprint, except for the Yellow-billed Cuckoo. Indirect impacts such as those associated with construction (e.g., noise disturbance) are anticipated to be short-term in duration with potential for degradation of habitat due to encroachment and dumping.

The proposal to construct two new 12-storey buildings provides a collision risk for breeding birds (including locally significant species), in the Study Area. When birds encounter windows, they become disoriented by reflections or attempt to pass through a building if it appears that clear passage is possible (FLAP 2019).

A major cause of breeding bird mortality is associated with outdoor cats (Calvert et al. 2013). The increase in people living in this area may cause an increase in the number of cats residing in proximity to these natural features, some of which may be outdoor cats that hunt songbirds.

7.2 OTHER IMPACTS

7.2.1 Vegetation Removal

As shown on **Figure 5** (**Appendix A**), the cultural meadow community (CUM1-1) and hedgerows (FOCM5) are proposed for removal to accommodate the development. A total of 606 trees are proposed to be removed from the Subject Property, as detailed in the TPP (**Appendix F**). Mitigation measures to avoid impacts to wildlife during vegetation removal are discussed in **Sections 7.3.2.3**.

The provincially rare honey locust trees are not proposed for removal but the five black maples are in poor health and will be removed.

7.2.2 Hydrologic Impacts

Typical hydrologic impacts include an increase in overland flow for any given storm event and a reduction in infiltration rates results post-development due to the introduction of impervious ground surfaces. For this proposed development, as detailed in **Section 7.1.1**, the LID infiltration strategy has been designed to match and likely exceed pre-development infiltration volumes within the catchment that directs flows to the Torrance Creek PSW.

- Although an infiltration deficit is expected to occur in the portion of the Subject Property where groundwater flows westward towards the Upper Hanlon Creek Watershed, groundwater velocity and GRCA mapping contribute to the expectation that a detrimental effect to the existing hydrogeological form or function of the Hanlon Creek PSW is not anticipated, as detailed in **Section 7.1.1**.

Additionally, the quality of this storm runoff is impacted by urban land uses and activities, which if left uncontrolled, may impact downstream water quality. Stormwater management facilities are therefore proposed and designed to control and treat runoff prior to discharge.

7.3 RECOMMENDED MITIGATION MEASURES

The purpose of mitigation measures are to help avoid or minimize the potential negative effects of the proposed development. Such measures include site design (i.e., sited outside features and appropriate buffers), the implementation of construction controls (i.e. construction timing windows and stormwater management) and the incorporation of compensation measures (as appropriate) to offset any residual impacts that may occur. These management and mitigation measures are discussed below.

7.3.1 Site Design

The following mitigation measures have been incorporated into site design of the proposed development.

7.3.1.1 Buffers to Development

The primary mitigation measure for the proposed development is the avoidance of natural features. Secondarily, separation between natural features and the proposed development are incorporated into site design. The purpose of these buffers are to reduce impacts and protect the long-term ecological functions of the features. Setback of the development to the significant woodland is 10 m whereas setback to the Torrance Creek PSW is approximately 90 m, further buffered by deciduous (FOD5-6) and coniferous (FOC2-2) forests.

The specific functions of a buffer include (expanded from Castelle et al. 1992):

- moderate water level fluctuations
- improve water quality
- reduce impact of invasive species
- reduce and prevent impacts from human disturbance
- provide fish and wildlife habitat protection
- promote diversity with pollinator-friendly native plantings.

7.3.1.2 Access Control Fencing

Property demarcation fence will be required at the limits of development to separate the Subject Property from the woodland and wetland. Restricting access of landowners into the adjacent natural spaces is a key component of reducing potential impacts on the adjacent natural features.

7.3.1.3 Wildlife Friendly Building Design

To reduce the likelihood of bird strikes with buildings, mitigation measures can be incorporated into the design of a proposed building. The City of Toronto's Bird-friendly Best Practices Glass (2016) and 2017 Best Practices Effective Lighting (2017) provide guidance. Examples of measures that can be incorporated into the design of the proposed building to make glass more visible to avian wildlife include:

- design to eliminate fly-through conditions
- visual markers (e.g., frosted, film, opaque)
- awning and overhangs
- directing external lights downward
- use motion sensors on safety and security lighting.

7.3.2 Construction Mitigation

Mitigation measures proposed during construction are summarized below.

7.3.2.1 Construction Site Delineation

A construction fence (or heavy-duty silt fence) will be installed prior to any construction onsite. The purpose of this fence is to control potential sediment transport and to function as a visual boundary to mark the limits of construction activities. Fencing will be maintained throughout construction.

7.3.2.2 Erosion and Sediment Control

Prior to any grading or servicing works begin onsite, appropriate erosion and sediment controls will be implemented to minimize the potential deposition of silt and sediment into adjacent features or properties due to site grading works. Measures to restore any disturbed areas as soon as possible must be combined with appropriately designed erosion control measures. The proposed erosion and sedimentation controls include the following items:

- Steep slopes (>3:1) shall have erosion blankets.
- Light and/or heavy duty silt fencing will be erected on all site boundaries where there is potential for runoff to be discharged offsite, to protect adjacent and downstream lands from migration of sediment in overland flow. The location of this fencing will be adjacent to the limit of grading. Silt fencing must be erected before grading begins to protect adjacent and downstream areas from migration of sediment in overland flow.
- Temporary sediment basin will be constructed to provide sediment control for the site. Standards established by the Greater Golden Horseshoe Area Conservation Authorities require 125 m³/ha for dead storage or 185 m³/ha if the L:W ratio is less than 4:1 or the draw down time for active storage is less than 48 hours. Live storage of 125 m³/ha with a minimum 48-hour draw down time and a minimum 4:1 L:W ratio is also required. The sediment control basins are to be inspected regularly and sediment removed when the depth of dead storage is reduced by one-half of the design depth.
- Erosion control berms/swales will be located in appropriate (critical) areas to divert flows to the sediment basins.
- A construction entrance feature (“mud mat”) will be provided at all site entrances to minimize the offsite transport of sediment via construction vehicles.
- Runoff will be directed to temporary sediment basins via swales to minimize untreated runoff discharged from site.
- Swales constructed onsite will have coir logs to help attenuate flows and encourage deposition of suspended sediment where appropriate.
- All disturbed areas where construction is not expected for 30 days shall be re-vegetated with 50 mm of topsoil and hydro-seeded according to OPSS 572.
- During construction, all catchbasins are to be sealed until roads are paved to prevent sediment deposition in the batch basin’s sumps and conveyance of silt to the SWMF.
- Following completion of construction, defined as 90% house construction, and site stabilization, all erosion and sediment control measures and accumulated sediment are to be removed.

7.3.2.3 Construction Timing for Wildlife

Given the presence of breeding birds on, and adjacent to, the Subject Property, tree and vegetation removal (i.e. disturbance to nests) should avoid the breeding bird window between April 1st and August 31st in accordance with the *Migratory Bird Convention Act*. Implementation of these timing windows will also act as a precautionary mitigation measure to protect potentially new bat roost trees.

The cultural meadow contains rubbish and wood chip piles that may provide cover habitat for snakes on the Subject Property, including Red-bellied Snake which is considered locally significant. If possible, removal of these features is recommended outside the active period for snakes, such that removal occurs between November 1 and March 30.

Movement of deer across the Subject Property under existing conditions is expected to be highest in the fall as deer move into the Torrance Creek PSW for the winter. Vegetation removal to minimize impact to moving deer on the Subject Property is not recommended between late-November and mid-January.

7.3.3 Stormwater Management

Urban development is typically associated with an increase in the quantity and a decrease in the quality of post-development flows. Appropriate quantity and quality controls must be proposed in accordance with the *Stormwater Management Practices Planning and Design Guidelines (*MOE 2003). Enhanced water quality control and peak flow detention will be provided through the proposed stormwater management design, detailed in the FSR (**Appendix G**).

7.3.4 Tree Preservation and Compensation

The following is a summary of the total inventoried trees located within the Subject Property, trees to be retained, trees to be removed, and trees that require compensation:

- total trees inventoried in area = 707
- trees to be retained = 101
- trees to be removed = 606
- removals that are invasive species or trees in poor condition (with greater than 70% dead crown), or dead that will not be compensated for = 88
- trees to be removed that will be compensated for = 518

The City of Guelph requires compensation for the loss of canopy cover for trees in fair to excellent condition, except for invasive species. The City requires a replacement ratio of 3:1 for 60 mm replacement trees, 5:1 for shrubs, or $500 cash in lieu for each tree removed. Full details are provided in the TPP, attached in **Appendix F**.

Additionally, compensation for butternut that are proposed for removal or impact (i.e., within 25 m) will be implemented under Ontario Regulation 242/08 Section 23.7. The number of compensation butternuts will depend on the results of the butternut health assessment.

8.0 PROPOSED MONITORING PROGRAM

During construction and post-construction monitoring is proposed for the Subject Property to avoid residual impacts associated with the development.

8.1 CONSTRUCTION MONITORING

Stantec is recommending compliance monitoring during construction, which will include the daily inspection of:

- erosion and sediment controls
- compliance with the grading plan
- limits of construction and that retained trees are protected.

Construction compliance monitoring reports will be provided monthly to the City of Guelph while the Subject Property is being actively developed. Reports will include inspection date details, observed conditions, and any recommended remedial actions (if necessary).

8.2 POST-CONSTRUCTION MONITORING

8.2.1 Stormwater Management Monitoring

Monitoring and maintenance activities are an important part of a stormwater management strategy to determine if the designed features continue to operate as intended. As such, Stantec is recommending that regularly scheduled inspections take place to observe any evidence of sediment deposition or malfunctioning of the proposed infiltration trenches or stormwater management facility. Given the proximity of the Subject Property to the Torrance Creek PSW, the details and frequency of these inspections will be discussed with the City and the GRCA, with these details being provided at the detailed design stage. If an Environmental Compliance Approval (ECA) is required from the MECP, the maintenance and monitoring schedule outlined in the ECA should be incorporated into the development plan. The inspections will occur following significant rainfall events (where possible) and will also include inspection of the conditions of any temporary stormwater management controls (such as temporary sedimentation basins and sediment traps).

Monitoring will consist of:

- annual inspections to ensure sediment, debris, and excessive vegetation are removed from the works to prevent the excessive buildup of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the works.
- erosion and sediment control monitoring
- OGS and CB Shields monitored to verify functioning as required (no timeline)

- water levels within infiltration gallery to be monitored semi-annually between 48-72 hours after rain (>10mm)
- monitor outfall semi-annually.

8.2.2 Vegetation Plantings

The successful establishment of the vegetation planted as part of the compensation program will be guaranteed for two years after installation. Monitoring will be conducted once in the spring and once in the fall and results will be summarized in an annual memo report with a 1:1 replacement of dead trees and shrubs.

8.3 NET ENVIRONMENTAL ASSESSMENT

Methods employed in the design of the site plan to minimize potential environmental impacts include:

- Measures to protect the adjacent PSW and Significant Woodland will be implemented (e.g., buffers to development, access control fencing).
- Measures to mitigate impacts to wildlife during construction have been proposed. This includes removal of vegetation outside of the breeding bird and bat window, active period for snakes, and period of high movement activity for deer, as well as the implementation of bird-friendly building design.
- Construction best management practices will be implemented (site delineation, erosion and sediment control, timing windows).
- Appropriate stormwater controls will be implemented to manage surface runoff during construction to maintain water quality.
- Tree compensation or cash in lieu for the proposed vegetation removal.

Based on the existing impacts and the implementation of the above mitigation and protective measures, construction impacts are expected to be temporary and short-term in duration. An adjustment for White-tailed Deer is anticipated post-construction as movement through the Subject Property will be diverted to the designated crossing location of Gordon Street to the south. Due to the highly adaptable nature of White-tailed Deer and preservation of the overwintering area, no significant adverse residual impacts are anticipated on deer, designated natural areas, vegetation, or wildlife and their habitat are anticipated.

9.0 POLICY COMPLIANCE

This report addresses the natural heritage features defined in the PPS, City of Guelph OP, GRCA Regulation 150/06, the Migratory Bird Convention Act, and the *ESA*, and demonstrates that the recommendations and intent of the relevant provincial and municipal policies have been incorporated in the proposed development.

9.1 PROVINCIAL POLICY STATEMENT

The natural heritage features identified (or assumed present) on or adjacent to the Subject Property include:

- significant wetlands (Hanlon Creek and Torrance Creek PSW)
- significant woodlands (Torrance Creek PSW and associated woodlands)
- SWH (bat maternity roosts, turtle overwintering, woodland raptor nesting, area-sensitive breeding birds, seeps and springs, habitat for species of conservation concern Snapping Turtle and Eastern Wood-Pewee, all associated with the PSW and significant woodland; wildlife movement corridor for White-tailed Deer)

- habitat of Endangered and Threatened Species (butternut, bat SAR)

Development is sited outside of the Torrance and Hanlon Creek PSW, consistent with the PPS which does not allow development within significant wetlands. Development is also cited outside of SWH features identified above, with the PPS allowing development in or adjacent to SWH if no negative impacts are anticipated. Although we anticipate redirecting of deer movement around the Subject Property post-development, significant negative impacts to deer and the other identified SWH in the Study Area are not anticipated with the implementation of the avoidance and mitigation recommendations described in **Section 7.3**.

Development and site alteration is not permitted within habitat of threatened or endangered species, except in accordance with provincial and federal requirements. Considerations for bat SAR and butternut are discussed under **Section 9.5**

9.2 CITY OF GUELPH

9.2.1 City of Guelph Official Plan

The City's OP permits development on lands adjacent to Significant Natural Areas or within Natural Areas if an EIS can demonstrate no negative impacts on the features or on their associated ecological functions. Significant impacts of the proposed development are not anticipated with the implementation of the avoidance and mitigation recommendations described in **Section 7.3**. Therefore, the proposed development is in accordance with the OP.

Minimum setbacks required in the OP have been respected by the proposed development (i.e., 30 to PSW, 10 to significant woodland).

9.2.2 Zoning By-Law

A zoning by-law change is being sought for the proposed development to change from single detached residential to residential apartment with site-specific provisions.

9.2.3 Tree By-law

Tricar will secure a tree cutting permit prior to any additional tree cutting activities on the Subject Property.

9.2.4 Subwatershed Studies

The Torrance Creek subwatershed, studied by Totten Sims Hubicki et al. (1998) and the Hanlon Creek subwatershed, studied by MMM and LGL in the Hanlon Creek Watershed Plan (1993), were consulted during the preparation of the FSR (**Appendix G**) and Hydrogeological Assessment report (**Appendix E**). Both studies, along with the *City of Guelph Development Engineering Manual* (2019), were consulted to determine the most appropriate stormwater criteria for the Subject Property.

9.3 GRAND RIVER CONSERVATION AUTHORITY

The proposed development is located within the GRCA's regulated area, as shown on **Figure 1** (**Appendix A**), within the area of interference (i.e., 120 m) of the Torrance Creek PSW.

The development is consistent with Policies described in **Section 2.3**, including:

- the Hydrogeological Assessment Report provided in **Appendix E** indicated that the hydrogeological function of the Torrance Creek PSW to the northeast of the Subject Property will not be impacted by the proposed development. The planned post-development LID infiltration strategy, as summarized in **Sections 6.1.1**. and **7.1.1**. of this report, is designed to maintain existing/pre-development groundwater flow volumes towards this PSW.
- construction best management practices will be implemented during construction.
- a permit from the GRCA will be sought prior to construction.

9.4 MIGRATORY BIRD CONVENTION ACT

Vegetation removal is recommended to occur outside of the core breeding bird season (i.e., April 1 until August 31), which would avoid incidental take of any migratory bird nests, and thus be in compliance with the Migratory Bird Convention Act.

Nest sweeps are a secondary tool to avoid incidental take, but only if timing windows described above cannot be met and in simple habitats where vegetation is easy to search. Because vegetation removal is proposed predominantly in hedgerow and residential communities, nest sweeps may be effectively conducted if required.

9.5 ENDANGERED SPECIES ACT

Bat SAR and butternut may be impacted by the proposed development.

An exemption to impact (i.e., remove, construct within 25 m) the onsite butternut trees will be sought under Ontario Regulation 242/08 Section 23.7. This exemption permits impacts to butternut trees if certain conditions are met and rules contained within the regulation are followed (e.g., butternut health assessment, compensation plantings, monitoring, etc.).

Although bat exit surveys did not confirm use at any of the identified candidate roost trees located within the hedgerows and residential areas, bat SAR were documented during surveys conducted in 2018. As a precautionary mitigation measure with respect to potentially new bat roosts, tree clearing will be conducted outside the active breeding bat period from May 1 to August 31.

10.0 SUMMARY AND RECOMMENDATIONS

10.1 REPORT SUMMARY

The following can be concluded based on the results of the background review, applicable policies and field investigations conducted by Stantec and NRSI in support of the EIS:

- Results of the background records review identified the following features on the Subject Property and/or in the Study Area
    - Hanlon Creek and Torrance Creek PSW (**Figure 1, Appendix A**)
    - deer wintering habitat (**Figure 1, Appendix A**):
    - locally and provincially significant wetlands (City of Guelph OP Schedule 4A)
    - significant woodlands (OP, Schedule 4C)
    - significant wildlife habitat (OP, Schedule 4E)
    - deer crossing and ecological linkage (OP, Schedule 4).
- The subsurface of the Subject Property consists of low permeability deposits of dense sand, silt, and Port Stanley Till (silty sand to sandy silt till), which is characterized by low infiltration potential.
- A groundwater flow divide is present on the Subject Property, with flow moving northeast across the site towards Torrance Creek PSW at an estimated velocity of 0.23 m/year (i.e., one meter every 4.3 years) and to the southwest towards Gordon Street at an estimated velocity of 0.52 m/year (i.e., one meter every 1.9 years).
- The Subject Property is characterized by downward vertical hydraulic gradients, which ranged from -0.5 to -1.0 over the monitoring period and indicate that the site is a groundwater recharge area. Neutral (neither recharge or discharge condition) to upward vertical hydraulic gradients (discharge condition) consistently occur in the adjacent Torrance Creek Swamp, although the vertical gradient is observed to switch to downward (recharge condition). However, the potential volume of groundwater discharging to the Torrance Creek PSW during those periods where discharge conditions are present is expected to be minimal, given that groundwater moves at a very slow rate through the overburden deposits (i.e., one meter every 4.3 years).
- Various wildlife studies were conducted to characterize the vegetation, avian, amphibian, reptile, mammal, and terrestrial crayfish within the Study Area, as presented in **Section 4.4.**
- SWH occurs on or adjacent to the Subject Property, as detailed in **Section 5.3**, including:
    - deer wintering congregation areas (SWM, FOC2-2)
    - candidate bat maternity colonies (SWM3-2, FOD5-6)
    - special concern and provincially rare wildlife (Eastern Wood-Pewee, Snapping Turtle)
    - turtle wintering area (SWM3-2)
    - woodland raptor nesting habitat (SWM3-2)
    - seeps and springs (SWM3-2)
    - woodland area sensitive breeding bird habitat (SWM3-2)
    - deer crossing and ecological linkage (City of Guelph OP)
    - habitat of Endangered and Threatened Species (butternut, bat SAR).

- One provincially rare plant (honey locust) was documented on the Subject Property but is proposed to be retained. It is possible this tree was planted based on the location along property boundaries.
- Locally significant wildlife species (Barn Swallow, Eastern Wood-Pewee, Hairy Woodpecker, Pileated Woodpecker, Yellow-billed Cuckoo, Red-bellied Snake) and plants (butternut, black maple) were identified, predominantly outside of the proposed project footprint, as shown on Figure 5, Appendix A.
- The proposed development consists of two 12-storey residential buildings, one fronting on Gordon Street and one adjacent to the southwest boundary of the Subject Property. Surface and underground parking, stormwater management infiltration galleries, and internal roadways are proposed to service the proposed development. A park block is also included in the proposed development.
- The proposed stormwater management plan will provide water quantity control by a combination of rooftop controls over both the west and east building and a subsurface storage tank located in the underground parking structure at the north section of the development. Flows from the rooftop controls will have a flow split, sending all flows for 25 mm or less to the infiltration facility and all larger flows to the storm sewer on Gordon Street. An on-site infiltration (rock) trench is proposed to promote infiltration of the rooftop and parking lot runoff to the groundwater system, with overflows backing up to a subsurface storage tank and ultimately out-letting to the Gordon Street storm sewer. The rock trench is designed to at least maintain pre-development infiltration volumes occurring in the catchment that provides groundwater flow to the Torrance Creek PSW under the post-development condition.
- Potential impacts of the proposed development on the adjacent natural features are associated with construction (e.g., disturbance to wildlife, erosion and sedimentation, dust, encroachment), biological contamination (e.g., invasive species), encroachment (i.e., ad-hoc trails, dumping), and vegetation removal, as discussed in Section 7.0.
- A series of measures, detailed in Section 10.2 below, are provided to mitigate and offset potential impacts of the proposed development.
- In the proper implementation of the detailed mitigation measures, no net environmental impacts are anticipated as a result of the proposed development. This is in accordance with the various policies and regulations summarized in Section 9.0

10.2 RECOMMENDATIONS

Impacts to wildlife and adjacent natural features, arising from the proposed development, as described above, can be reduced using the following mitigation measures, detailed in **Section 7.3**:

- prior to construction, development or other alteration associated with the proposed development within the Regulation Limit defined by the GRCA, a Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit be issued by the GRCA pursuant to Ontario Regulation 150/06
- prior to the start of construction activities, clearly mark the limits of construction
- standard sediment and erosion control measures are recommended, to be monitored regularly and properly maintained, as required

- where evidence of sedimentation or erosion exists, undertake corrective action as soon as conditions permit
- sediment and erosion controls are to be removed only after the soils of the construction area have been stabilized and adequately protected until cover is reestablished
- disturbance to nesting birds covered under the MBCA and bat SAR can be avoided through restriction of tree clearing activities between April 1 and August 31
- tree removal should be compensated for at a ratio of 3:1 for 60 mm replacement trees, or 5:1 for shrubs, where possible
- complete a butternut health assessment and compensation plan in accordance with Ontario Regulation 242/08 Section 23.7
- stormwater management using best management practices (FSR; Appendix G)
- Bird Friendly Guidelines be utilized during building design
- a vegetation compensation/landscape plan for the Subject Property will be prepared as part of the Environmental Implementation Report (EIR).

Based on the implementation of the above mitigation and protective measures, impacts are expected to be temporary and short-term in duration during construction. No significant adverse residual impacts on designated natural areas, vegetation, or wildlife and their habitat are anticipated post-construction.

In closing, this EIS is respectfully submitted in accordance with various sections set out in the City of Guelph's Official Plan as well as the GRCA's Ontario Regulation 150/06.

11.0 REFERENCES

Alverson, W. S., D. M. Waller, and S. L. Solheim. 1988. Forests Too Deer: Edge Effects in Northern Wisconsin. Conservation Biology 2(4): 348-358.

Bird Studies Canada (BSC). 2008. Marsh Monitoring Program Manual.

Brouillet, L., F. Coursol, S.J. Meades, M. Favreau, M. Anions, P. Bélisle & P. Desmet. 2010+. VASCAN, the Database of Vascular Plants of Canada. http://data.canadensys.net/vascan/

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage and A. R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto. Xxii + 706 pp.

Calvert, A.M., C. A. Bishop, R.D. Elliot, E.A. Krebs, T.M. Kydd, C.S. Machtans, and G. J. Robertson. 2013. A Synthesis of Human-related Avian Mortality in Canada. Avian Conservation & Ecology. 8(2): 11.

Castelle, A.J., C. Conolly, M. Emers, E.D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, S.S. Cooke. 1992. Wetland Buffers: Use and Effectiveness. Adolfson Associates, Inc., Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia, Pub. No. 92-10.

Chapman, L.J. and D.F. Putnum, 1984. The Physiography of Southern Ontario: Third Edition. Ontario Geological Survey, Special Volume 2.

City of Guelph. 2012. Locally Significant Species List. Online at: http://guelph.ca/wp-content/uploads/LocallySignificantSpeciesListCityofGuelphJune2014.pdf

City of Guelph. 2018. City of Guelph Official Plan 2001; Consolidated March 2018.

City of Guelph Engineering and Transportation Services. 2019. Development Engineering Manual. City of Guelph. January 2019.

City of Toronto. 2016. Bird-friendly Best Practices Glass. https://www.toronto.ca/wp-content/uploads/2017/08/8d1c-Bird-Friendly-Best-Practices-Glass.pdf

City of Toronto. 2017. 2017 Best Practices Effective Lighting. https://www.toronto.ca/wp-content/uploads/2018/03/8ff6-city-planning-bird-effective-lighting.pdf

COSEWIC. 2008. COSEWIC assessment and status report on the Snapping Turtle *Chelydra serpentina* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 47 pp.

COSEWIC. 2010. COSEWIC assessment and status report on the Bobolink *Dolichonyx oryzivorus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 42 pp.

COSEWIC. 2011a. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 37 pp.

COSEWIC. 2011b. COSEWIC assessment and status on the Eastern Meadowlark *Sturnella magna* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. X + 40 pp.

COSEWIC. 2012. COSEWIC assessment and status report on the Wood Thrush *Hylocichla mustelina* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 46 pp.

COSEWIC. 2013a. COSEWIC assessment and status report on the Grasshopper Sparrow pratensis subspecies *Ammodramus savannarum* pratensis in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 36 pp.

COSEWIC. 2013b. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp.

COSEWIC. 2014. COSEWIC assessment and status report on the Eastern Milksnake *Lampropeltis triangulum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 61 pp.

COSEWIC. 2016. COSEWIC assessment and status report on the Monarch *Danaus plexippus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 59 pp.

COSEWIC. 2017. COSEWIC assessment and status report on the Butternut *Juglans cinerea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 74 pp.

COSEWIC. 2018a. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 63 pp.

COSEWIC. 2018b. COSEWIC assessment and status report on the Red-headed Woodpecker *Melanerpes erythrocephalus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp

COSSARO. 2013. COSSARO Candidate Species at Risk Evaluation for Eastern Wood-Pewee (*Contopus virens*). Prepared by the Committee on the Status of Species at Risk in Ontario (COSSARO).

Credit Valley Conservation Authority and Toronto and Region Conservation Authority. 2010. Low Impact Development Stormwater Management Planning and Design Guide.

Dobbyn, J. 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Dougan & Associates. 2009. Guelph Natural Heritage Strategy. Phase 2: Terrestrial Inventory and Natural Heritage System. Volume 1. March 2009.

Environment Canada. No Date. North American Breeding Bird Survey Instructions and Safety Guidelines Available: http://ec.gc.ca/reom-mbs/5EE0ADBA-A60B-4142-9ADD-644F35E5935E/BBS_instructions_formatted_EN.pdf

Environment and Climate Change Canada (ECCC). 2014. Reducing Risk to Migratory Birds. Available: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reducing-risk.html. Accessed 2019.

Farrar, J.L. 1995. Trees in Canada. Fitzhenry & Whiteside Limited and the Canadian Forest Service. Canada. 198 pp.

Fatal Light Awareness Program (FLAP) Canada. 2019. https://flap.org/. Accessed 2020.

Fisheries and Oceans Canada (DFO). 2020.

Gaughan, C. R., and S. DeStefano. 2005. Movement patterns of rural and suburban white-tailed deer in Massachusetts. Urban Ecosystems 8: 191-202

Grand River Conservation Authority (GRCA). 2015. Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. October 2015.

Grand River Conservation Authority (GRCA). 2020. Mapping produced using information from the Grand River Information Network (GRIN), https://www.grandriver.ca/en/our-watershed/Maps-and-data.aspx.

Golder Associates Ltd. 2011. City of Guelph Tier Three Water budget and Local Area Risk Assessment. Appendix A: Characterization Final Report.

Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (*Myotis leibii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998 (with 2008 ELC code updates). Ecological Land Classification for Southwestern Ontario: first approximation and its application. Ontario Ministry of Natural Resources, South Central Region, Science Development and Transfer Branch. Technical Manual ELC-005.

Marshall, Macklin, Monaghan Limited (MMM) and L.G.L. Limited (LGL). 1993. Hanlon Creek Watershed Plan: Summary Report. City of Guelph, Ontario

Ministry of Natural Resources (MNR). 2000. Significant Wildlife Habitat Technical Guide. October 2000.

Ministry of Natural Resources (MNR). 2013. Surveying for the presence of Little Brown Myotis and Northern Myotis.

Ministry of Natural Resources and Forestry (MNRF). 2014. Ontario Wetland Evaluation System, Southern Manual. 284 pp.

Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. January 2015.

Ministry of Natural Resources and Forestry (MNRF). 2017. Survey Protocol for Species at Risk Bats within Treed Habitats. Little Brown Myotis, Northern Myotis & Tri-Colored Bat. Guelph District. 13 pp.

Ministry of Natural Resources and Forestry (MNRF). 2020a. Natural Heritage Information Centre (NHIC). Provincial status of plants, wildlife and vegetation communities database. Ministry of Natural Resources and Forestry, Peterborough. http://www.mnr.gov.on.ca/MNR/nhic/nhic.html

Ministry of Natural Resources and Forestry (MNRF). 2020b. Land Information Ontario (LIO). On-line Natural Heritage Mapping and Natural Heritage Information Database.

Ministry of the Environment (MOE). 2003. Stormwater Management Planning and Design Manual (SWMPD Manual).

Oldham, M., W. Bakowsky and D.A. Sutherland. 1995. Floristic Quality Assessment for Southern Ontario. Natural Heritage Information Centre, Ministry of Natural Resources, Peterborough. 68 pp.

Oldham, M. and Brinker, S. 2009. Rare Vascular Plants of Ontario, Fourth Edition.

Ontario Ministry of Municipal Affairs and Housing (OMAH). 2014. Provincial Policy Statement Under the Planning Act. April 2014.

Ontario Nature. 2020. Reptiles and Amphibians of Ontario. Accessed 2020. http://www.ontarionature.org/protect/species/reptiles_and_amphibians/index.php

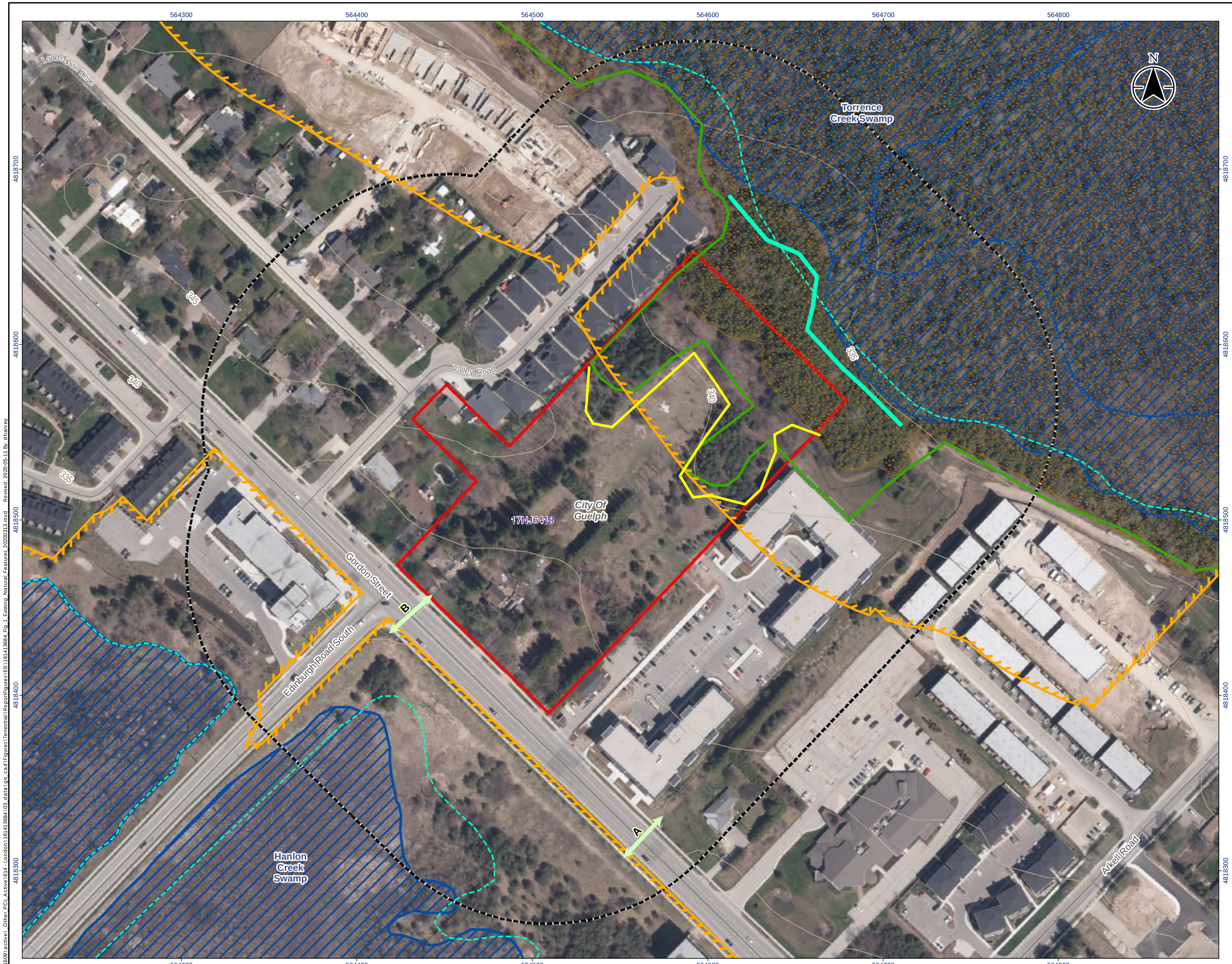
Patterson, B.R., B. A. MacDonald, B.A.Lock, D.G. Anderson, and L.K. Benjamin. 2002. Proximate factors limiting population growth of White-tailed Deer in Nova Scotia. Journal of wildlife management 66(2): 511-521.

Sabine, D.L., S.F. Morrison, H.A. Whitlaw, W.B.Ballard, G.J. Forbes, J. Bowman. 2002. Migration behavior of White-tailed Deer under varying winter climate regimes in New Brunswick. Journal of Wildlife Management. 66(3): 718-728.

Totten Sims Hubicki Associates, Ecological Services Group, Ray Blackport, Mark L. Dorfman Planner Inc., Shroeter & Associates, and Donald G. Weatherbe Associates. 1998. Torrance Creek Subwatershed Study - Management Study. Prepared for City of Guelph and Grand River Conservation Authority, September 1998, Revised November 1998.

XCG Consulting Limited. 2018. Geotechnical Investigation. Two 12-Storey Apartment Buildings 1242, 1250, 1260 Gordon Street. Guelph, Ontario. April 2018.

APPENDIX A
FIGURES



Stantec

Legend

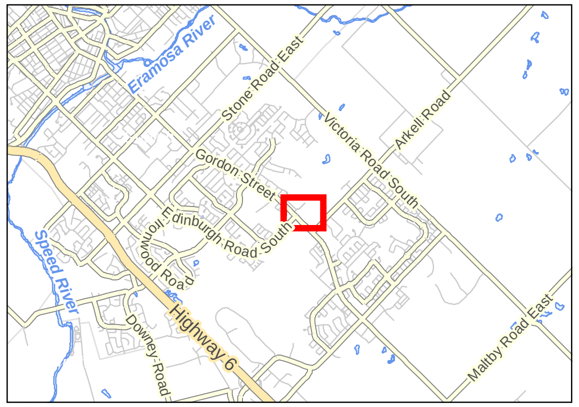
- ▨ Study Area (120 m)
- 🟥 Subject Property
- Approximate Wetland Boundary (Stantec 2019)
- Deer Crossing (City of Guelph OP Schedule 4)
- Dripline (NRSI, 2014)
- Contour (5 m Interval)
- Watercourse (Permanent)
- ▨ Deer Wintering Area
- ▨ Regulation Limit (GRCA)
- ▨ Wetland, Provincially Significant
- ▨ Wetland (GRCA)
- 🟩 Wooded Area

0 50 100 Metres

1:2,200 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2020. Imagery flown in 2019.



Project Location
City of Guelph

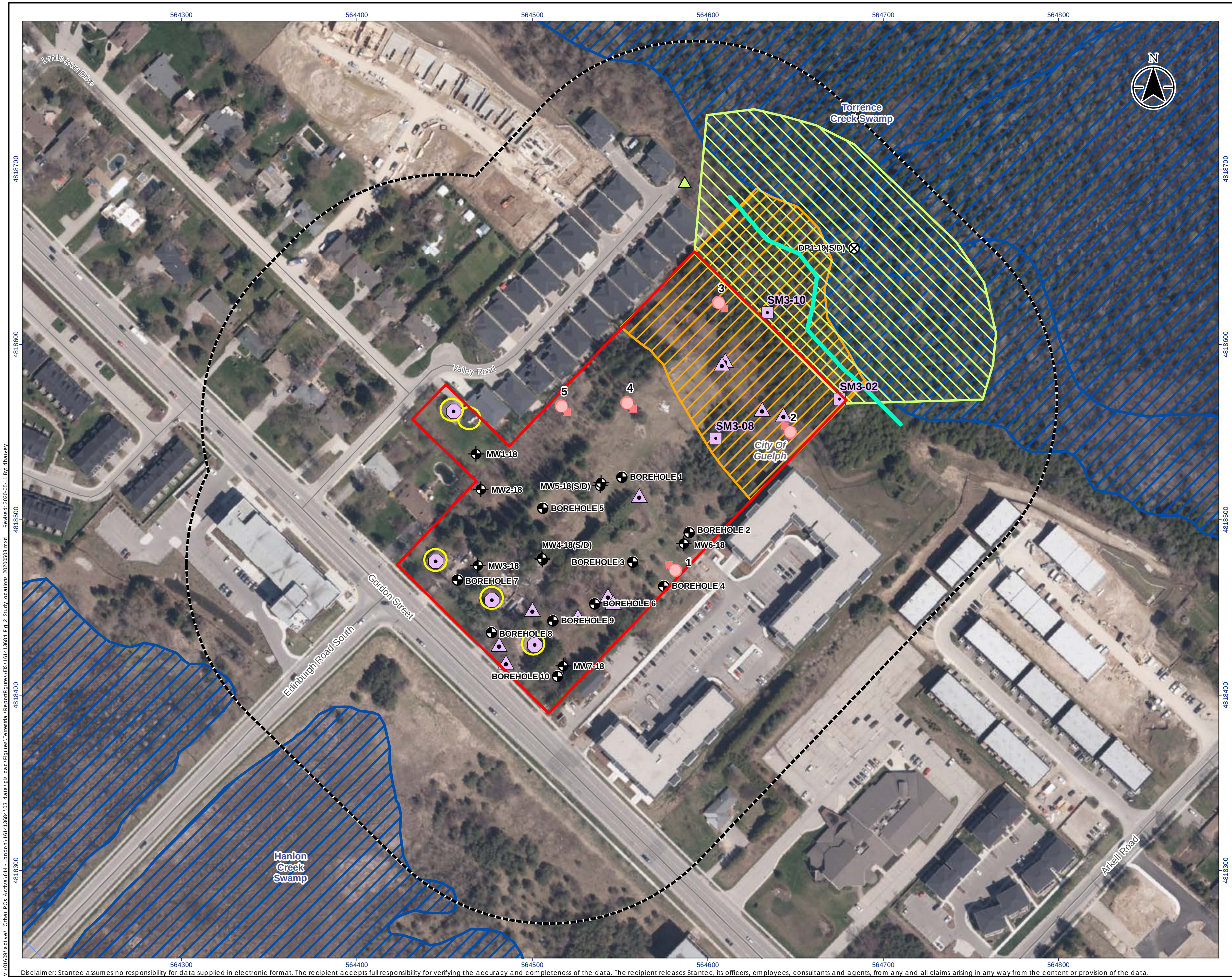
161413684 REVA
Prepared by DH on 2020-05-11

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD

Figure No.
1

Title
Study Area, Subject Property and Existing Natural Features

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\ReportFigures\EIS\161413684_Fig_1_Existing_Natural_Features_20200313.mxd Revised: 2020-05-11 By: dharvey



Stantec

Legend
- ⬚ Study Area (120 m)
- 🟥 Subject Property
- Approximate Wetland Boundary (Stantec 2019)
- Watercourse (Permanent)
- ▨ Wetland, Provincially Significant

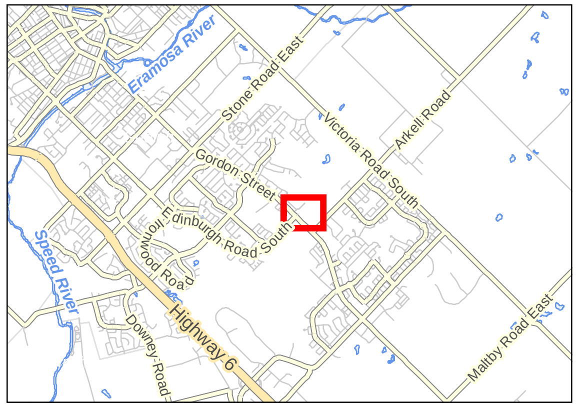
Survey Locations
- △ Amphibian Survey Location
- ○ Snake Habitat Assessment
- Trail Camera Location
- ⊕ Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ● Borehole (CMT Engineering, 2018)
- ▨ Amphibian Habitat Assessment
- ▨ Terrestrial Crayfish Survey Area

Bat Acoustic Survey
- ▣ Automated
- ⬢ Building
- △ Snag

0 50 100
Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2017.



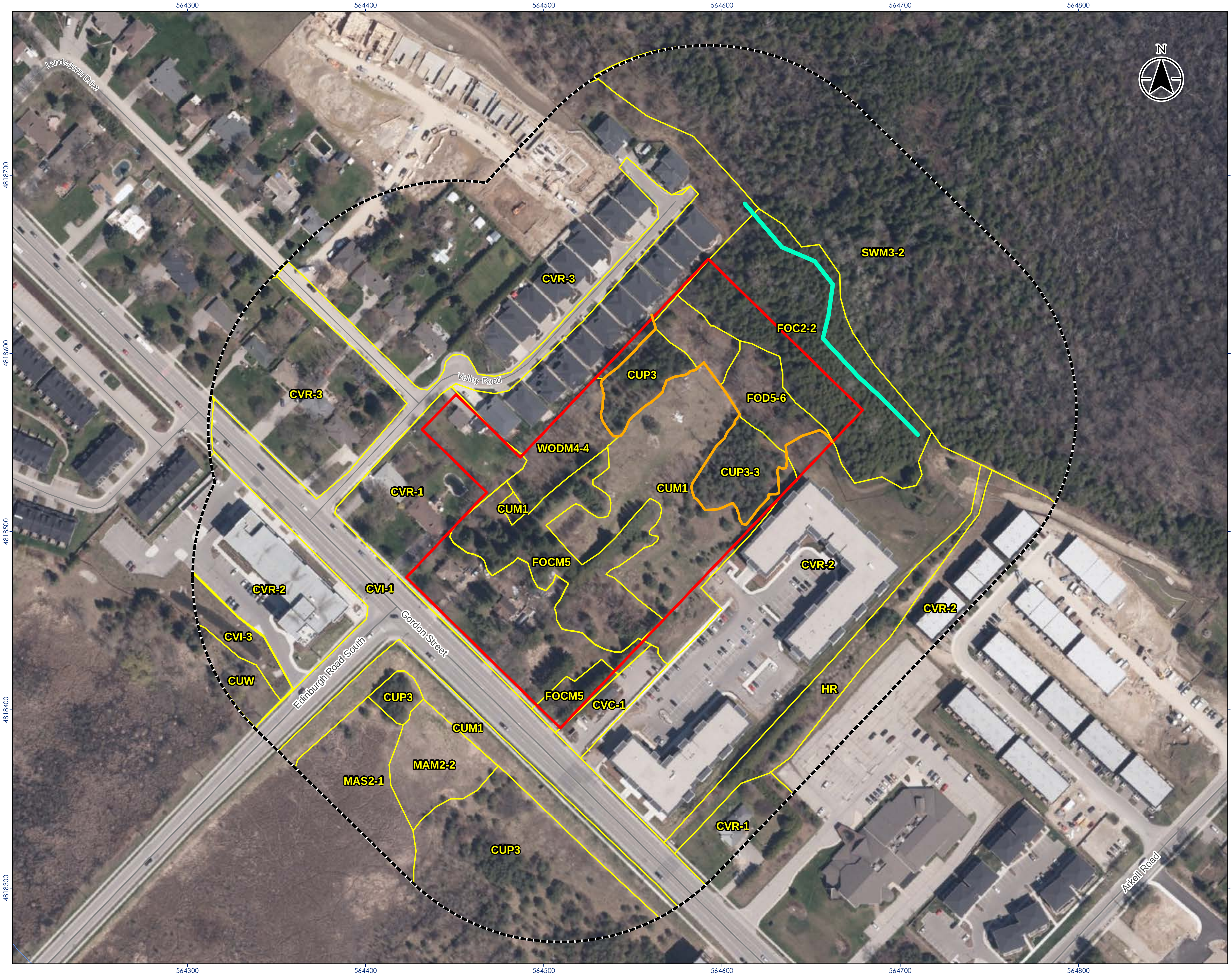
Project Location
City of Guelph

161413684 REVA
Prepared by DH on 2020-05-11

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD

Figure No.
2

Title
Study Locations



Stantec

Legend
⬚ Study Area (120 m)
🟥 Subject Property
🟨 ELC Boundary
━ Approximate Wetland Boundary (Stantec 2019)
— Watercourse (Permanent)
━ Woodland Boundary

ELC Communities
- CUM1- Mineral Cultural Meadow Ecosite
- CUP3-3- Scotch Pine Coniferous Plantation Type
- CUP3- Coniferous Plantation
- CUW- Cultural Woodland
- CVC-1- Business Sector
- CVI-1- Transportation
- CVI-3- Sewage and Water Treatment
- CVR-1- Low Density Residential
- CVR-2- High Density Residential
- CVR-3- Single Family Residential
- FOC2-2- Dry White Cedar Coniferous Forest Type
- FOCM5- Naturalized Coniferous Hedge-row Ecosite
- FOD5-6- Dry – Fresh Sugar Maple – Basswood Deciduous Forest Type
- HR- Hedge-row
- MAM2-2- Reed-canary Grass Graminoid Mineral Meadow Marsh Type
- MAS2-1- Cattail Mineral Shallow Marsh Type
- SWM3-2- Poplar-Conifer Deciduous Mixed Swamp
- WODM4-4- Dry - Fresh Black Walnut Deciduous Woodland Type

0 25 50
Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2020. Imagery flown in 2019.

Project Location
City of Guelph

161413684
Prepared by DH on 2020-05-11

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD

Figure No.
3

Title
Vegetation Communities

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\ReportFigures\EIS\161413684_Fig_03_ELC.mxd Revised: 2020-05-11 By: dharvey

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\ReportFigures\EIS\161413684_Fig_04_Locally_Sig_Species.mxd Revised: 2020-05-11 By: dharvey

Stantec

Legend

- ⬚ Study Area (120 m)
- 🟥 Subject Property
- — Watercourse (Permanent)

Species at Risk

- ● Butternut

Rare Species

- ⊗ Honey Locust

Locally Rare

- ⊗ Locally Significant Species Observation
- ⊕ Black Maple

0 25 50 Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. 3. Orthoimagery © First Base Solutions, 2020. Imagery flown in 2019.

Project Location
City of Guelph

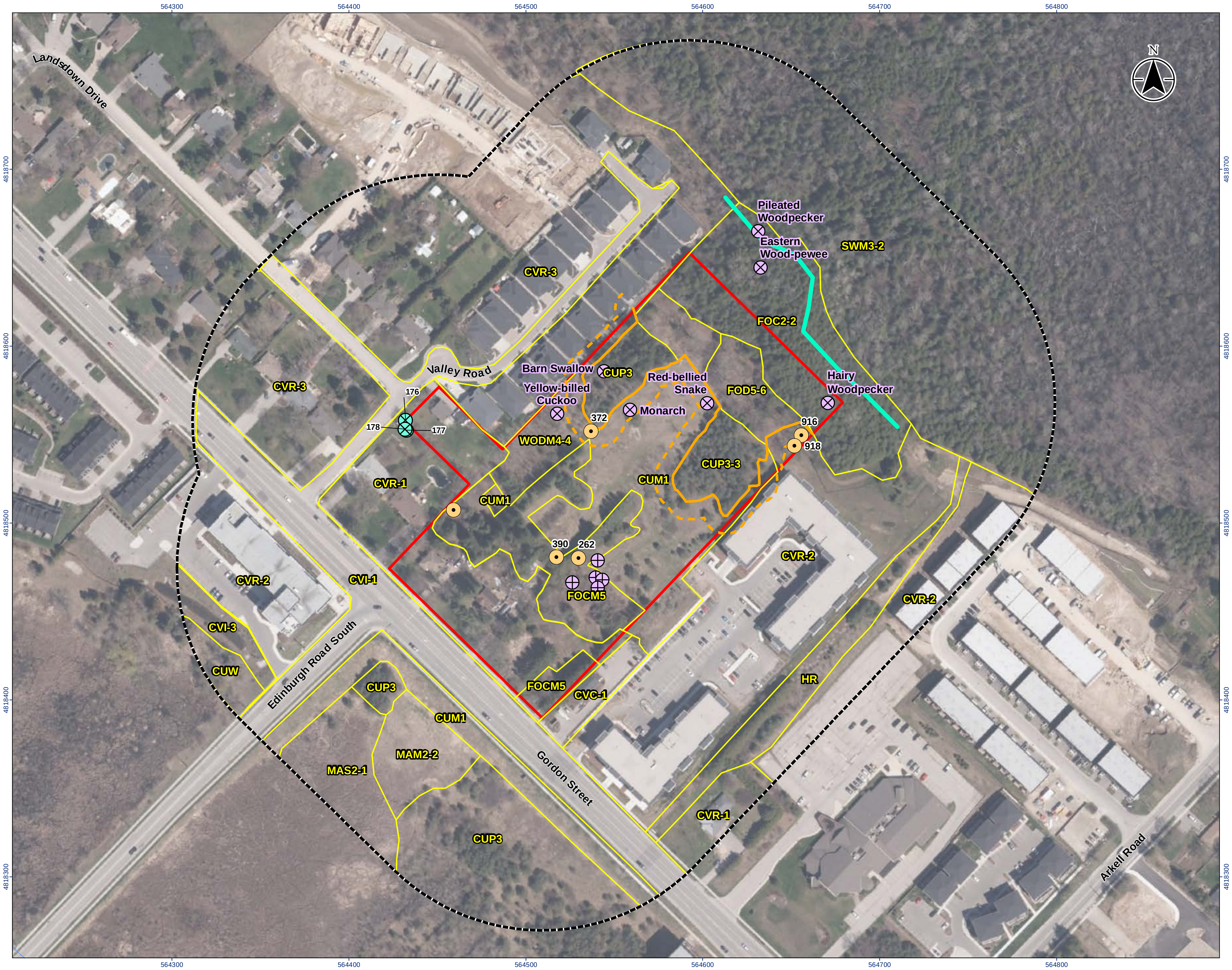
161413684
Prepared by DH on 2020-05-11

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD

Figure No.
4

Title

Species at Risk, Rare and Locally Significant Species Observations



Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\ReportFigures\EIS\161413684_Fig05_NaturalFeatures.mxd Revised: 2020-05-11 By: dharvey

Stantec

Legend

- ⬚ Study Area (120 m)
- 🟥 Subject Property
- ━ Approximate Wetland Boundary (Stantec 2019)
- ━ Woodland Boundary
- ╍ Woodland Setback
- ─ Watercourse (Permanent)
- ▭ ELC Boundary

Species at Risk

- ⊙ Butternut

Rare Species

- ⊗ Honey Locust

Locally Rare

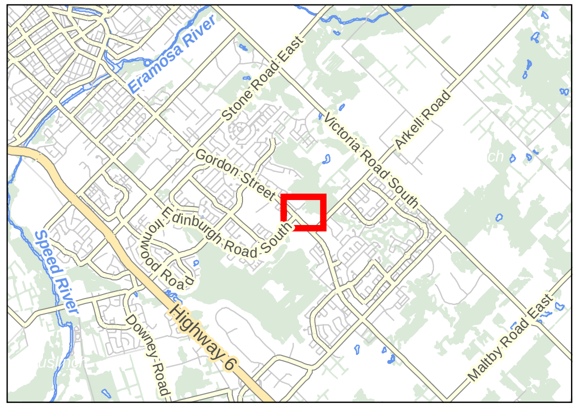
- ⊗ Locally Significant Species Observation
- ⊕ Black Maple

0 25 50 Metres

1:2,200 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



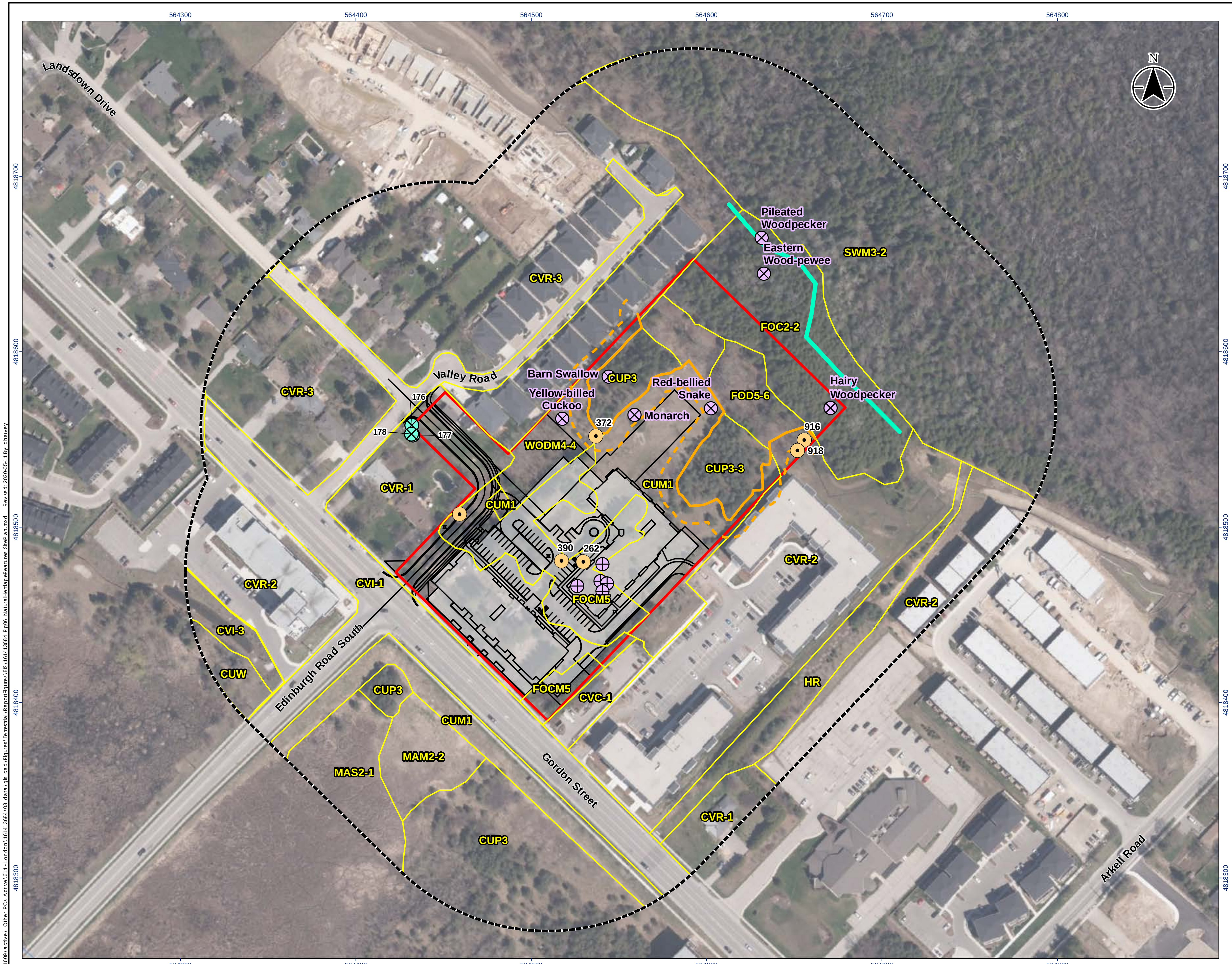
Project Location
City of Guelph

161413684
Prepared by DH on 2020-05-11

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
5

Title
Natural Heritage Features



Stantec

Legend
▭ Study Area (120 m)
🟥 Subject Property
— Proposed Development Plan
▭ Proposed Extent of Underground Parking
— Approximate Wetland Boundary (Stantec 2019)
— Woodland Boundary
- - Woodland Setback
— Watercourse (Permanent)
▭ ELC Boundary

Species at Risk
● Butternut

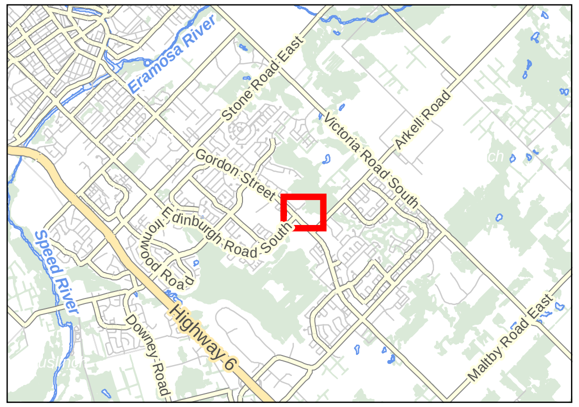
Rare Species
⊗ Honey Locust

Locally Rare
⊗ Locally Significant Species Observation
⊕ Black Maple

0 25 50 Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



Project Location
City of Guelph

161413684
Prepared by DH on 2020-05-11

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
6

Title
Natural Heritage Features and Site Plan

APPENDIX B
CORRESPONDENCE

APPENDIX B.1
CITY OF GUELPH

City of Guelph
Making a Difference

August 10, 2018

Chris Hendriksen
Stantec Consulting Ltd
600-171 Queens Street
London, Ontario
chris.hendriksen@stantec.com

Dear Mr. Hendriksen

The City of Guelph would like to thank you for attending the Development Review Committee meeting on June 13, 2018 to discuss the proposal and complete application requirements for the lands located at 1242, 1250, 1260 Gordon Street and 9 Valley Road.

The proposal is to amend the Zoning By-law to allow the development of two 12 storey buildings with a total of 351 units. The one building would have townhouse units on the first floor facing Gordon Street. The proposed development would have 443 parking spaces.

Please see the attached summary where staff have identified the required planning applications, studies and plans needed to be able to deem your application complete under the Planning Act.

If there are any questions please contact the undersigned or the specific department staff noted in the attached summary.

Chris DeVriendt, MCIP, RPP
Manager of Development Planning
Planning Services
Infrastructure, Development & Enterprise

T 519-822-1260 ext. 2360
F 519-822-4632
E Chris.devriendt@guelph.ca

1. Mandatory Pre-consultation Requirement Summary

Mandatory Pre-Consultation Summary

Site Address: **1242, 1250, 1260 Gordon Street and 9 Valley Road**

Existing Official Plan Designation: High Density Residential

Existing Zoning: Apartment Residential R1.B

Application Type:

☒ Plan of Subdivision ☐ Official Plan Amendment

☒ Zoning By-law Amendment ☐ Plan of Condominium

Application Fees:

Application	City of Guelph	GRCA	
Official Plan Amendment			
Zoning By-law Amendment	X		
Plan of Subdivision	X		
Plan of Condominium			
Multiple Application Fee	$41,308.50 (* based on Fee - By-law in effect at this time) +		

Separate cheques are required and payable to the City of Guelph and the GRCA.
Development Agreement Fee $795.00
+ Development Approval Fee and Plan of Subdivision Approval Fee - payable at a later date

Submission Requirements **Reports, Studies, Plans** (see Appendix for additional details)			
	Required	Paper Copies	Notes/Staff
Completed Application Form (s)	☒	2	With original Signature
Conceptual Site Plan			
Draft Plan of Subdivision/Condo	☒	28	
Planning Justification Report	☒	5	See Comments
Draft Proposed Zoning By-law Amendment	☒	1	
Draft Proposed Official Plan Amendment	☐		
Urban Design Brief	☒	6	
On Street Parking Plan	☐		
Streetscape Plan	☐		
Building Elevations/Renderings	☒ β		Part of UDB

Legal Survey of Site	☒	2	
Functional Servicing Report	☒	15	See Comments
Draft Servicing and Grading Plan	☒	15	
Existing Conditions/Contour Plan/Easements	☒	15	See Comments
Drainage Plan	☒	15	
Storm Water Management Report	- ☒	15	See Comments
Landscape Plan	☐		
Lighting Plan/Photometric Plan	☐		
Tree Inventory/Preservation Plan	- ☒	15	See Comments
Traffic/Transportation Impact Study	- ☒	8	See Comments
Truck Turning/Movement Plan	☐		
Hydrology Study	✓ ☒	8	See Environmental Planning Comments
Geotechnical/Soil Report	☒ BO	8	
Agricultural Impact Assessment Report	☐		
Commercial Market Impact Study Scoped	☐		
Financial Impact Study	☐		
Noise Study	☒ BO	5	
Vibration Study			
Shadow Analysis	☒ BO	8	
Heritage Impact Study	☐		
Archaeological Report	☐		
Cultural Heritage Impact Assessment	☐		
Wind Impact Study	☒ BO	8	
Environmental Impact Study (EIS)	✓ ☒	15	See Comments
Environmental Implementation Report (EIR)	☐		
Phase I Environmental Site Assessment	☐		
Phase II Environmental Site Assessment	☐		
Record of Site Condition Report	☐		
Height Survey of Adjacent Buildings	☐		
Employment Lands Needs Analysis	☐		
Employment Lands Conversion Justification	☐		
Affordable Housing Report	☐		
Rental Conversion Report	☐		
Source Water Protection	☐		
Digital Submission of all plans/reports PDF	☒	All	
Other (Specify)	☐		

Additional Staff Comments:

Planning – Lindsay Sulatycki

The subject property is designated "Significant Natural Areas and Natural Areas" and "High Density Residential" in the City's Official Plan. The "High Density Residential" land use designation permits a maximum height of 10 storeys and a maximum density of 150 units per hectare. The proposed development of 351 units within two (2) – 12 storey buildings and townhouses exceeds the maximum permissible density and height limits of the "High Density Residential" land use designation. As per Policy 9.3.5 (4) of the Official Plan, increased height and density may be permitted for development proposals on arterial and collectors roads without an amendment to the Official Plan subject to the Height and Density Bonus provisions of the Official Plan.

Based on the above, you are encouraged to pursue bonusing for this development instead of an Official Plan Amendment for additional height and density. Please refer to Policy 10.7 – Height and Density Bonus Provisions of the Official Plan and provide rationale and justification on how your proposal meets these provisions. This rationale can be included as a section in the Planning Justification Report. Staff are available to meet to discuss bonusing when you are close to being ready to submit an application.

Engineering – Shophan Daniel
Preliminary cross section/design for the proposed road will be required.
Servicing capacities will be reviewed once we receive an application, however, as discussed at the meeting, there is currently no capacity available within the City's Sanitary Sewer therefore a 'H' (holding) symbol will be placed on the property until such time the a new sewer is installed.

Additional items may be required during the review of the application.

Transportation – Gwen Zhang
A Traffic Impact Study is required for this application. Please have the traffic consultant provide the study's Terms of Reference for Staff review and approval prior to commencing the study.

At the intersection of Edinburgh Road and Gordon Street, the consultant is required to provide plans showing the lane configurations from all approaches. In the west approach, the existing right-turn lane needs to be maintained. The intersection alignment will be reviewed and any modification will be at the applicant's expense.
A sightline analysis is required at the southeast corner of Edinburgh Road and Gordon Street intersection.

The proposed easterly driveway location is supported by Staff. This driveway will form the third approach of a T-intersection. Sufficient sightlines must be provided at this driveway. Due to the close proximity, the westerly driveway is not needed.

The centerlines of Landsdown Drive and its extension will be aligned up, and the extension will have a right-of-way of 20 metres.

The following requirements can be dealt with at the site plan stage:

- The parking lot layout must following City's Development Engineering Manual.
- The consultant is required to provide geometrics plan for all large truck movements on site.

- TDM requirements include parking demand and supply, electric vehicle charging station, and bike parking, etc.

Environmental Planning – April Nix
Portions of the site are identified as a "Significant Natural Area" in the City's Official Plan and as such require an Environmental Impact Statement (EIS) to ensure that there are no negative impacts to protected features in relation to the proposed development. Consideration needs to be given to unmapped/unknown natural heritage features and areas and an application, including the EIS will need to incorporate and consider all of the City's natural heritage system policies that may apply.

The detailed requirements of the EIS will be determined through the submission of an EIS Terms of Reference (TOR) to the City and the scope of the EIS should be confirmed through City acceptance of a TOR with the City in advance of undertaking field studies. As a starting point, an EIS should generally include: a Tree Inventory, Preservation and Compensation Plan, breeding birds surveys, complete floral inventory (three seasons), confirm/update ELC & incidental observations. The EIS will need to include and consider all elements of the development proposal including surface and underground parking, trails and stormwater management areas.

The City has a DRAFT EIS Guideline which may be of assistance in the preparation of the TOR. It can be found at:

http://guelph.ca/living/environment/environment-planning/draft-guidelines-preparation-environmental-impact-studies/

The site is in the Torrence Creek subwatershed, the subwatershed study for the Torrence includes targets and recommendations that will need to be considered through the EIS. In addition, due to the proximity to the Arkell PSW, the hydrology of the wetland should be characterized and an associated water balance for the natural feature should be prepared as part of a Hydrogeological Report to support the EIS, in addition to the water budget which forms part of the SWM report. This should include consideration for any ground water impacts as a result of underground parking if/where proposed. Incorporation of Low Impact Development (LID) as part of the stormwater management approach is also encouraged.

The site is also regulated under the City's Tree By-law and any tree removals will require authorization from the City. The development application should also look for opportunities to retain trees and integrate them into the development proposal. A Tree Inventory & Preservation Plan, undertaken by a qualified arborist, is required and should include the following:

- Tree inventory information for all trees 10cm DBH or greater proposed to be removed/retained including: Tree # corresponding to plan/drawing, species name, DBH, crown diameter, condition (vigour), remarks, recommended action and rationale;
- Identify shared, public and private trees with crowns that are within 6m of property lines;

- Identify opportunities for protection, enhancement and restoration of trees within the Urban Forest; and,
- Tree Protection Fencing locations and/or other tree protection methods.

Please be aware that where preservation is not possible, as agreed to by the City, compensation is required. A Landscaping, Replanting and Replacement Plan including details for all compensation being provided through replacement plantings. Please also note that:

- Where preservation is not feasible, note that the City is seeking compensation at a 3:1 replacement ratio;
- Where replacement plantings are not achievable cash in lieu may be accepted at a rate of $500 for each tree damaged or destroyed;
- In accordance with the City's Urban Forest Management Plan and City policies, incorporate canopy trees into the site design; and,
- In accordance with the City's Official Plan, use native species in the landscape plan except in areas where harsh conditions limit their survival.

Parks Planning – Jyoti Pathak
The Owner shall be responsible for parkland dedication to the satisfaction of the Deputy CAO of Public Services pursuant to s.51.1 of the *Planning Act*, and in accordance with the policies of the City of Guelph Official Plan.

A combination of parkland conveyance and payment of money in lieu of parkland would be required. The amount of land/payment would be calculated through the development review process through the submission of an appraisal to determine the cash in lieu amount. The property owner is responsible for the cost of the appraisal.

Notes

1. The purpose of this document is to identify the information required to commence processing a complete application as set out in the *Planning Act*. Pre-consultation does not imply or suggest any decision whatsoever on the part of City staff or the Corporation of the City of Guelph to either support or refuse the application. Comments provided at a pre-consultation are preliminary and solely based on the information submitted for review at that time.

2. The *Planning Act* timelines associated with a formal full application will not begin if that application is submitted without the information identified in the mandatory pre-consultation meeting, and all of the required fees paid.

3. When a full application is made, the cheque for the application fee may be processed immediately; however this does not constitute the application being deemed complete for *Planning Act* purposes.

4. Digital copies of the all the reports/studies are required to be submitted in PDF format as part of the application. Plans are to be submitted in JPEG format.

5. The City of Guelph may require the peer review of a technical report submitted by the applicant. If this is required, the applicant will be advised and will be charged a fee equal to the cost of the peer review.

6. Once an application has been submitted, deemed complete and circulated for comments, it may be determined that additional studies/ reports or information will be required as a result of issues arising during the review of the application. The applicant will be required to provide this at their expense.

7. An application submitted without the requisite information and number of copies identified in the pre-consultation letter will not be considered a complete application.

8. This document and the comments expire 6 months from the day of signing or at the discretion of the Manager of Planning or his/her designate. If after 6 months no applications are received, staff may identify a need for an additional pre-consultation meeting prior to submission.

9. There may also be financial requirements arising from the applications, including, but not limited to, park dedication, development charges, payment of outstanding property taxes, deferred local improvements charges, costs of lifting 0.3 metre reserves, and reimbursement for road widening acquisition or road improvements.

Appendix – Reports and Plans Summary

Archaeological Assessment Report
Required for all applications in or near areas of archaeological potential, as determined by Planning Staff. A report must be completed in accordance with Provincial requirements in or near areas of archaeological potential.

Building Elevations/Renderings
Drawings or Plans which illustrate the exterior design of the building including the proposed building materials. Drawings can be either 2- dimensional or 3 dimensional. Drawing sets in colour would be preferred.

Planning Justification Report
A Registered Professional Planner must submit a report providing planning justification for the proposed amendment in light of the principals, objectives and policies of the City's Official Plan and the technical studies accompanying the application. The goal of the report is to document how the proposed departure from the local policies and regulations represents good planning and is in the public interest. The report must: describe the site context; address applicable provincial policy; describe the proposal in detail including preliminary site plan details if applicable ; address applicable local Official Plan policies (e.g. policies relating to compatibility, intensification, re-designation criteria and conversion policies); discuss findings of the technical studies in the context of the Official Plan and other Policy.

Conceptual Site Plan Layout
Concept plan showing the proposed development in context of adjacent lands including land across the street. The plan is to show all buildings, land uses, sidewalks, driveways, street trees, street intersections and any other natural or made elements.

Cultural Heritage Impact Assessment Report
A Heritage Impact Assessment demonstrates how new development involving a heritage resource will preserve, protect, improve and/or manage resources.

Draft Official Plan Amendment
The applicant must provide proposed amended text and/or map amendments for consideration.

Draft Plan of Subdivision and/or Draft Plan of Condominium
The information required on plans is to be in accordance with the Planning Act and its regulations. All drawings are to be folded approximately to 8.5 x 11.

Stormwater Management Report
Stormwater management reports address a number of engineering issues. There are terms of reference that are to be followed as set out by the City of Guelph.

Urban Design Brief
Required for all applications where, in the opinion of the Senior Urban Designer. Urban Design Briefs will be required in larger projects and in key areas within the City's urban structure such as the Downtown, Mixed Use Nodes, and Intensification corridors in addition to sensitive infill. The Urban Design Brief is one of the City's tools to ensure

that new development has been consciously examined and evaluated on sites, and provided design solutions that are context-sensitive and respond to urban design policy context. It will also help co-ordinate and articulate how the elements of the public and private realm will work together. The Design Brief shall explain and illustrate why the proposed development represents the optimum design. Contact the City Planning department for the terms of reference for the Urban Design brief.

Streetscape Plan
A plan that identifies how the area of the property in the private realm will integrate with the existing or proposed streetscape design in the public realm. The plan generally needs to identify paving and planting materials.

Functional Servicing Report
Functional servicing studies address a number of engineering issues. There are terms of reference that are to be followed as set out by the City of Guelph.

Tree Inventory and Preservation Study
Required when a property under application contains woodlots, tree stands or hedgerows. A tree survey must be prepared by a qualified professional, identifying all existing trees, their type, size and condition, those trees proposed to be removed and retained, and the methods to be used to ensure preservation of those trees to be retained.

Traffic/Transportation Impact Study
The purpose of a Traffic Impact Study is to identify the need for modifications to the city's transportation system regarding a new development/redevelopment by estimating the travel demands related to the development and assessing the impacts that the development would have on the present and future transportation system. Transportation Demand Management (TDM), transit and non-motorized modes will all be taken into account in estimating travel demand.

Truck Turning/Movement Plan
This plan illustrates how delivery trucks and /or garbage trucks will load and unload materials on the site and the location of travel through the site.

Geotechnical/Soils Report
The purpose of the investigation will be to determine the type of soil, its engineering properties, bearing capacity, soil permeability, location of groundwater, and to verify whether contamination is present.

Noise and Vibration Study
A noise and/or vibration study determines the impact on adjacent developments and recommends mitigation measures.

Shadow Analysis Plan
Required for all applications where, in the opinion of the Planning and Building Department, the proposal may result in impacts on adjacent properties from sun shadowing.

Heritage Impact Study

Required as determined by Planning Staff for any property designated pursuant to the Ontario Heritage Act, identified on the City's Inventory of Heritage Resources, or for any property located adjacent to a designated or otherwise inventoried property.

Market Impact Study

The purpose of this study is to address the existing market and potential impacts of an application. These studies will be evaluated by the City on the basis of a peer review to be undertaken at the applicant`s expense.

From:	Leah Lefler
To:	"Ken Burrell"
Cc:	Chris Leigh; Dave Stephenson
Subject:	RE: 1242, 1250, 1260 Gordon St. - November site meeting overview (proj2347A)
Date:	Wednesday, December 11, 2019 8:53:28 AM
Attachments:	image001.png image003.png

Hi Ken,

Thank you for providing this memo and record of our site visit. I can confirm that it accurately reflects our site visit and discussions.

I will be reviewing the revised tree plans that were submitted in support of the demo permits for 1242 and 1250 Gordon Street today. I will follow up with an email to confirm the number of tree removals approved to permit the demos. This way we will be able to compare notes and make sure the number of compensation plantings I have tallied matches what you are expecting.

Thanks again for providing this documentation. It is very helpful for record keeping, and for ensuring that we are all on the same page moving forward.

Regards,
Leah

Leah Lefler, Planner II Environment
Planning and Building Services, **Infrastructure, Development and Enterprise**
City of Guelph
519-822-1260 extension 2362
leah.lefler@guelph.ca

From: Ken Burrell <kburrell@nrsi.on.ca>
Sent: Monday, December 2, 2019 10:45 AM
To: Leah Lefler <Leah.Lefler@guelph.ca>
Cc: CLeigh@tricar.com; Dave Stephenson <dstephenson@nrsi.on.ca>
Subject: 1242, 1250, 1260 Gordon St. - November site meeting overview (proj2347A)

Hi Leah,

I trust you're well. Please find attached a memo that provides an overview of the November 6th site meeting regarding the properties located 1242, 1250, and 1260 Gordon St.

If you could confirm that this letter accurately describes the site meeting and our discussions on-site would be greatly appreciated.

If you have any questions or concern, please don't hesitate to contact me.

Thank you,

Ken

--

Ken Burrell M.E.S.
Terrestrial and Wetland Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 403 (f) 519-725-2575
(w) www.nrsi.on.ca (e) kburrell@nrsi.on.ca
@nrsinews

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Memo

Project No. 2347A

To: **Leah Lefler, City of Guelph**

Cc: **Chris Leigh, Tricar Development Group**

From: **David Stephenson, Ken Burrell**

Date: **December 2, 2019**

Re: **9 Valley Road, 1242, 1250, and 1260 Gordon Street, Guelph – Site Visit (November 6, 2019) Overview**

On behalf of Tricar Development Group (Tricar), Natural Resource Solutions Inc. (NRSI) provides this letter as a record to discussions held by NRSI (L. Hockley, D. Stephenson, and K. Burrell) and City of Guelph staff (L. Lefler) on November 6, 2019, on the properties located at 1242, 1250, and 1260 Gordon Street, Guelph.

Tree Violation and Compensation

NRSI discussed with L. Lefler tree violation and compensation requirements on-site. NRSI understands that the City of Guelph has documented the illegal cutting and/or damage of 31 trees within the properties located at 1242, 1250, and 1260 Gordon Street, Guelph. These trees are protected under the City of Guelph's Tree By-law (2010)-19058. Under the City's Tree By-law, trees illegally cut and/or damaged are required to be compensated following guidance from the City of Guelph.

In addition, it was discussed that Tricar is pursuing the demolition of houses located at 1242, 1250, and 1260 Gordon Street, Guelph, which will require additional tree removals and compensation in accordance with the City of Guelph Tree By-law (2010)-19058.

As such, NRSI outlined our approach with respect to tree compensation on-site for the trees removed and trees proposed for removal to L. Lefler. NRSI and L. Lefler toured the properties in question and discussed the proposed planting location (i.e. the northeast corner of the properties), and it was agreed that this approach was acceptable. Going forward NRSI will prepare a single comprehensive planting plan for the trees removed at 1242, 1250, and 1260 Gordon Street, Guelph, to satisfy the City of Guelph's Tree By-law (2010)-19058.

Significant Woodland

NRSI and L. Lefler discussed the significant woodland boundary and confirmed that the boundary delineated by NRSI in 2014/2017 with City of Guelph staff was reflective of the site and the current conditions. As such, the Environmental Impact Study in support of the development proposed by Tricar will be prepared reflecting the boundary delineated by NRSI and the City of Guelph in 2014/2017.

NRSI and L. Lefler also discussed that, in accordance with the City of Guelph Official Plan, development and/or site alteration was not supported within the significant woodland buffer, with the exception of permitted uses as defined by the Official Plan.

Discussions between L. Lefler and NRSI also documented that planting was strongly encouraged to occur within the significant woodland buffer as a method of encouraging best practices for ecological restoration and protecting the natural heritage system. It is NRSI's understanding that this will occur in the development of the site.

If you could confirm that this letter accurately describes the discussions held on-site relating to the topics described above would be greatly appreciated. If you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

Natural Resource Solutions Inc.,

David Stephenson, M.Sc.,
Certified Arborist and Senior Biologist

Ken Burrell, M.E.S.,
Terrestrial and Wetland Biologist

APPENDIX B.2
MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ministry of
Natural Resources
And Forestry

Guelph District
1 Stone Road West
Guelph, Ontario
N1G 4Y2

Ministère des
Richesses naturelles
et des Forets

Telephone: (519) 826-4955
Facsimile: (519) 826-4929

July 12, 2018

Natalie Taylor M.Sc.
Terrestrial Ecologist
natalie.taylor@stantec.com

RE: 1250 Gordon St
Guelph, ON

Dear Ms. Taylor,

The Ministry of Natural Resources and Forestry (MNRF), Guelph District Office, has reviewed the natural heritage information available for the above-noted property and surrounding area (the "study area"), and offers the following comments:

WETLANDS

The Ministry has identified the following provincially significant wetlands (PSWs) within the study area:

- Torrance Creek Swamp

AREAS OF NATURAL AND SCIENTIFIC INTEREST

The Ministry notes that there are no Areas of Natural and Scientific Interest (ANSIs) within the study area.

SPECIES AT RISK

There are records in the area for the following species at risk (SAR):

- Snapping Turtle *(Chelydra serpentina)* SC

Threatened and Endangered Species receive both individual species and habitat protection under the *Endangered Species Act, 2007* (ESA). SAR habitat prescribed under regulation is listed in Ont. Reg. 242/08 (https://www.ontario.ca/laws/regulation/080242).

Please be advised that because the province has not been surveyed comprehensively for the presence of listed species, the absence of a record does not necessarily indicate the absence of SAR from an area. To determine the presence of SAR for a given study area, the District's recommended approach is as follows:

I. Habitat Inventory

The Ministry recommends undertaking a comprehensive botanical inventory of the entire area that may be subject to direct and indirect impacts from the proposed activity. The vegetation communities should be classified as per the “Ecological Land Classification (ELC) for Southern Ontario” system, to either the “Ecosite” or “Vegetation Type” level. For aquatic habitats in the study area, we recommend that you collect data on the physical characteristics of the waterbodies and inventory the riparian zone vegetation, so that these habitats can be classified as per the Aquatic Ecosites described in the ELC manual.

II. Potential SAR within the Study Area

A list of SAR that have the potential to occur in the area can be produced by cross-referencing the ecosites described during the habitat inventory with the habitat descriptions of SAR known to occur within the planning area. The list of SAR known to occur in the **CITY OF GUELPH** is attached for your reference. The species-specific COSEWIC status reports (https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html) are a good source of information on habitat needs and will be helpful in determining the suitability of the study areas ecosites for a given species.

Please note that the Species at Risk in Ontario (SARO) List is a living document that is periodically amended as a result of species assessment and re-assessments conducted by the Committee on the Status of Species at Risk in Ontario (COSSARO). The SARO List can be accessed on the following webpage: https://www.ontario.ca/environment-and-energy/species-risk-ontario-list.

COSSARO also maintains a list of species to be assessed in the future. It is recommended that you take COSSARO’s list of anticipated assessments into consideration, especially when the proposed start date of an activity is more than 6 months away, or the project will be undertaken over a period greater than 6 months. This list can be viewed at: https://www.ontario.ca/page/how-comment-protecting-species-risk.

III. SAR Surveys

The Ministry recommends that each potential SAR identified under Step II is surveyed for, regardless of whether or not the species has been previously recorded in the area. The survey report should describe how each SAR was surveyed for, and provide a rationale for why certain species were not afforded a survey (e.g., habitat within the study area is not suitable for a specific SAR). Please note that some targeted surveys may require provincial authorizations (e.g., ESA permit or Wildlife Scientific Collector’s Permit).

ADDITIONAL INFORMATION

Natural heritage features (e.g. wetlands, ANSIs) can be viewed for a given study area through the MNRF’s “Make a Map” web application: https://www.ontario.ca/page/make-natural-heritage-area-map. Digital data layers can be obtained through the Land Information Ontario (LIO) geowarehouse https://www.ontario.ca/page/land-information-ontario.

Additionally, the MNRF recommends contacting the municipality and the conservation authority to determine if they have any additional information or records of interest for the study area.

Please be advised that it is your responsibility to comply with all other relevant provincial or federal legislation, municipal by-laws, other MNRF approvals or required approvals from other agencies. If your investigations reveal the presence of Threatened or Endangered species, please contact the MNRF at esa.guelph@ontario.ca for further direction.

Sincerely,

Melinda Thompson

Melinda Thompson
Management Biologist

From:	Taylor, Natalie
To:	esa.guelph@ontario.ca
Cc:	Eusebi, Daniel
Subject:	Information Request - 1242, 1250, 1260 Gordon St and 9 Valley Rd EIS
Date:	Tuesday, June 26, 2018 3:38:00 PM
Attachments:	16143684_Field_Map.pdf MNRF Guelph District Information Request Form.pdf

---

Good afternoon,

Please find an information request form and project location map attached to this email for the properties of 1242, 1250 and 1260 Gordon St and 9 Valley Rd.

If you have any questions, please do not hesitate to contact me.

Kind regards,

Natalie

Natalie Taylor M.Sc.
Terrestrial Ecologist

Direct: 519 780-8155
Mobile: 226 971-3826
Fax: 519 836-2493
natalie.taylor@stantec.com

Stantec
1-70 Southgate Drive
Guelph ON N1G 4P5 CA

APPENDIX C
TERMS OF REFERENCE

From: Leah Lefler
To: Straus, Melissa
Cc: Hendriksen, Chris; Bendig, Brandie
Subject: RE: 1250 Gordon EIS Terms of Reference Resubmission
Date: Wednesday, February 27, 2019 11:38:25 AM

Hi Melissa,

Thank you for providing the updated terms of reference for the EIS for the proposed development at 1250 Gordon Street. I can confirm that all comments have been appropriately addressed. This version (version 2) can be referred to as the final TOR.

Thank you,
Leah

Leah Lefler, Planner II Environment
Planning and Building Services, **Infrastructure, Development and Enterprise**
City of Guelph
519-822-1260 extension 2362
leah.lefler@guelph.ca

From: Straus, Melissa <Melissa.Straus@stantec.com>
Sent: Tuesday, January 22, 2019 10:52 AM
To: Leah Lefler <Leah.Lefler@guelph.ca>
Cc: Hendriksen, Chris <Chris.Hendriksen@stantec.com>; Bendig, Brandie <Brandie.Bendig@stantec.com>
Subject: 1250 Gordon EIS Terms of Reference Resubmission

Hi Leah,

Please find attached the updated terms of reference for the EIS for the proposed development at 1250 Gordon (version 2).

Let me know if you have any questions or additional comments.

Thank you very much,

Melissa Straus M.Sc.
Terrestrial Ecologist

Direct: 519 780-8103
Mobile: 226 971-2704
Fax: 519 836-2493
Melissa.Straus@stantec.com

Stantec
1-70 Southgate Drive
Guelph ON N1G 4P5 CA

Stantec

Stantec Consulting Ltd.
1-70 Southgate Drive, Guelph ON N1G 4P5

January 21, 2019
File:161413684

Attention: Leah Lefler, Environmental Planner
City of Guelph
City of Guelph City Hall, 1 Carden Street
Guelph, ON N1H 3A1

Dear Ms. Lefler,

Reference: 1242, 1250 and 1260 Gordon Street and 9 Valley Rd, Updated Environmental Impact Study Terms of Reference (version 2), Guelph, ON

The following provides a Terms of Reference (ToR) for an Environmental Impact Study (EIS) for properties at 1242, 1250 and 1260 Gordon Street and 9 Valley Road, City of Guelph (herein referred to as the Subject Property). A high-density residential development is proposed on the Subject Property and requires an EIS in support of Zoning By-Law and Official Plan Amendments. The location of the Subject Property is shown on **Figure 1** (**Attachment A**).

A ToR for the proposed EIS was previously submitted to the City July 23, 2018 (dated July 19, 2018) and was heard at the City's Environmental Advisory Committee (EAC) on September 12, 2018. EAC supported the ToR with a list of conditions, as identified in the City's motion (**Attachment B**), with the addition of a hydrogeological study with specifics required for inclusion. A second set of comments were provided on October 17, 2018 which included a consolidated list of Environmental Planning, Parks, and GRCA comments (**Attachment B**).

The following scope of work outlined below incorporates comments received to date and is an update of the previously submitted ToR. Since our first submission, most of the field studies proposed were undertaken and therefore this version of the ToR includes details on these completed surveys. It is our understanding that any outstanding comments on this EIS ToR will be discussed directly with City Staff.

INTRODUCTION

The introduction of the EIS will describe the location of the Subject Property and proposed development. Current and historical land uses for the Subject Property and surrounding landscape will be provided.

A Subdivision and Zoning By-Law Amendment application will be submitted for 1242,1250 and 1260 Gordon Street and 9 Valley Road, in the City of Guelph, Ontario. The Subject Property includes these four properties and is approximately 2.98 ha in size. Residence's at 1260 Gordon and 9 Valley Road are currently vacant. The 1260 Gordon property was noted to be overgrown and unkept at the time of initial site investigations (May 2018); the 9 Valley Road property was upkept and tidy. The Subject Property is bound by single family residential lots to the northeast and newly constructed apartments (high density residential) to the east and west. Forest and wetland features border the Subject Property at the northeast, and at the opposite side of Gordon Street to the south and west. Current land uses and existing natural features in relation to the Subject Property are shown on **Figure 2** (**Attachment A**).

The Study Area boundary includes lands within 120 m of the Subject Property.

PROPOSED DEVELOPMENT

This section will outline the proposed development concept including but not limited to details on density, land uses, servicing infrastructure, stormwater management (SWM) and public trails/parks.

The development proposal is currently being refined. Currently, Tricar (the client), is proposing to develop the Subject Property with two 12 storey apartment buildings having surface and below grade parking.

PLANNING CONTEXT

The Land Use Designation for the Subject Property is currently High Density Residential, as per Schedule 2 of the City of Guelph Official Plan (No. 48) (2018). The Subject Property is immediately adjacent to Significant Natural Areas & Natural Areas to the northeast and south; however, the property to the south is currently a new build for a high-density residential apartment complex. The Subject Property is zoned as R.1B "*Residential – Single Detached Dwellings*" as per the City of Guelph Zoning By-Law (2016).

The Subject Property is located within both the Hanlon Creek and Torrance Creek Subwatersheds.

Plans and policies relating to natural heritage that will be considered include:

- Provincial Policy Statement (2014)
- City of Guelph Official Plan (consolidated March 2018)
- City of Guelph Zoning By-law (1995, last amendment 2016)
- City of Guelph Tree By-law (2010-19058)
- Guelph Trail Master Plan (City of Guelph, 2005)
- Urban Forest Management Plan (City of Guelph, 2016)
- Hanlon Creek Watershed Plan (1993)
- Torrance Creek Subwatershed Study (Totten Sims Hubicki 1999)
- Ontario Regulation 150/06 (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation)
- Natural Heritage Reference Manual (MNRF, 2010)
- Significant Wildlife Habitat Technical Guide (MNRF, 2000)
- Significant Wildlife Habitat Criteria Schedules for EcoRegion 6E (MNRF, 2015)
- Endangered Species Act (2007)

BACKGROUND REVIEW

BACKGROUND DATA COLLECTION

A background review of the following sources will be completed including, but not limited to:

- Current and Historical Aerial Photography
- Land Information Ontario Natural Heritage Mapping [LIO] (MNRF, 2018a)
- Natural Heritage Information Centre Data [NHIC] (MNRF, 2018b)
- Guelph Natural Heritage Strategy (Dougan, 2009)
- GRCA mapping and additional background information
- Atlas of Breeding Birds of Ontario (Cadman et al., 2007) and ebird
- Atlas of the Mammals of Ontario (Dobbyn, 1994)
- Ontario Reptile and Amphibian Atlas (Ontario Nature, 2018)
- Great Lakes Conservation Blueprint for Terrestrial Biodiversity (Henson and Brodribb, 2005)
- EIS reports from adjacent lands, if available

Additional data was obtained through an information request to the Ministry of Natural Resources and Forestry (MNRF) Guelph District (received July 12, 2018) and the GRCA Grand River Information Network (GRIN; 2018).

EXISTING NATURAL HERITAGE FEATURES

This section will describe the existing natural heritage features within the Study Area. Natural features will be identified based on mapping provided in the City of Guelph Official Plan (OP), MNRF LIO, and the GRCA.

The City of Guelph Official Plan (March 2018) identifies components of the Natural Heritage System within the Study Area. These components include Significant Natural Areas (as shown on Schedule 4 of the City of Guelph OP) and overlap with the Torrance Creek Swamp Provincially Significant Wetland (PSW) and Hanlon Creek PSW (as shown on **Figure 2**, **Attachment A**). A portion of the Torrance Creek Swamp PSW is located in the Study Area but outside the Subject Property boundaries. The following designated natural features are associated with the Torrance Creek Swamp PSW that occur in the Study Area:

- locally and provincially significant wetlands (City of Guelph OP Schedule 4A)
- significant woodlands (City of Guelph OP Schedule 4C)

- Significant Wildlife Habitat (SWH; City of Guelph OP Schedule 4E)

The Subject Property is located within 120 m of a wetland that is regulated by the Grand River Conservation Authority Ont. Reg. 150/06, as shown on **Figure 2** (**Attachment A**).

SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

Species at risk are those species given status rankings by the Federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or the provincial Committee on the Status of Species at Risk in Ontario (COSSARO), as threatened or endangered according to federal or provincial legislation. Endangered and threatened species in Ontario receive general habitat protection under the ESA 2007. Special concern species are not afforded habitat protection and have been summarized as species of conservation concern (SOCC). On federal lands (e.g. First Nations reserves), endangered and threatened species as well as their residence and critical habitat are protected under the federal Species at Risk Act (SARA 2002).

A background data review will be compiled using various wildlife atlases (mammals, birds, herpetofaunal), as well as information provided by the NHIC (MNRF, 2018b) and records provided by the MNRF Guelph District through the information request (request sent on June 26, 2018). A list of potential SAR and SOCC that may occur on the Subject Property will be considered based on habitat characteristics present during site investigations. A full list of these species and a description of their habitat will be provided in the report.

CHARACTERIZING THE NATURAL ENVIRONMENT – APPROACH AND METHODS

This section will describe the biological and physical features and functions in the Study Area based on background review collected from secondary sources, consultation with agencies, and field investigations.

PHYSIOGRAPHY, SOILS, HYDROGEOLOGY AND NATURAL HAZARDS

A geotechnical investigation report, hydrogeological assessment report, stormwater management report, and landscape plans will be completed for the Subject Property. The hydrogeological work will include assessing the hydraulic relationship between the local groundwater system beneath the Subject Property and the adjacent Torrance Creek Swamp PSW that abuts the Subject Property to the northeast. Stantec is consulting with the land owner to gain permission to access the PSW to install drive-point piezometers. If access is not granted, the hydrogeological evaluation of the PSW in relation to the Site will be desktop-level based. If access to the PSW is denied, Stantec is confident that defendable conclusions can be made regarding the groundwater recharge and/or discharge function of the wetlands via a review of existing published hydrogeological information together with groundwater data collected from the Subject Property. This previously mentioned information will be used together with pre- and post-development water balance calculations (completed as per the stormwater management report) and groundwater dewatering calculations (as per the hydrogeological assessment report) to evaluate the potential for development impacts to the form and/or function of the wetlands. Low Impact Development (LID) will be considered as part of the stormwater management approach for the mitigation of hydrological (surface water) and hydrogeological (groundwater) impacts, as feasible.

The following physical, hydrological and hydrogeological features of the Subject Property will be briefly described:

- description of physiographic region and topography
- description of existing geological/hydrostratigraphic conditions of the subsurface and seasonal positioning of the groundwater table
- soil types and drainage characteristics
- areas of groundwater recharge and discharge and potential hydraulic connection to the wetlands
- surface water features
- catchment areas

FIELD INVESTIGATION METHODS

The following site-specific field investigations are completed or are proposed to characterize the extent and function of the natural heritage features within the Study Area:

Field Survey	Season/Timing	Status
Hydrogeological Studies		
Borehole drilling and monitoring well installations	January – December (i.e., year-round)	Installed between July 9 and 30, 2018.
Hydraulic conductivity testing	January – December (i.e., year-round)	Completed between July and September 2018
Groundwater level monitoring and quality testing	January – December (i.e., year-round)	In progress
Boundary Delineations		
Wetland Boundary Delineation	June-August	Flagging still exists from the 2014 delineation and appears accurate. To be confirmed by GRCA in 2019.
Woodland Boundary Delineation	May-September	To be confirmed by City of Guelph in 2019.
Vegetation Surveys		
Ecological Lands Classification	June, July, August	Completed on June 6, 12, July 5, and September 11, 2018.

Field Survey	Season/Timing	Status
Spring Botanical Inventory	June	Completed on June 6, 2018. See Section 4.2.3.2.
Summer Botanical Inventory	July	Completed on July 5, 2018.
Fall Botanical Inventory	August-September	Completed on September 11, 2018.
Tree Inventory	May-November	Partially completed, to be finalized winter 2018/2019.
Wildlife Surveys		
Amphibian Surveys	May, June	Round 1 completed on May 7, 2018. Habitat assessment completed on May 28, 2018. See Section 4.2.4.1.
Bat Roost Habitat Assessment	May	Completed on June 12 and 13, 2018. See Section 4.2.2.6.
Bat Exit Surveys	June	Extensive surveys completed, twice in June at each building and 5 potential habitat trees. Survey dates: June 12, 13, 14, 19, 21, 25, 26, 2018. Automated recorders were also set out for weeks in forested habitats. Survey locations are provided on **Figure 3** (**Attachment A**).
Breeding Bird Surveys	June, July	Completed on June 12 and July 5, 2018.
Woodland Raptor Nest Search	May-June	Completed on May 28 and June 6, 12, 2018.
Terrestrial Crayfish	May-September	Completed on June 6, 12, July 5, and September 11, 2018. Survey location provided on **Figure 3** (**Attachment A**).

Field Survey	Season/Timing	Status
Snake Habitat Assessment and Incidental Surveys	May-October	Foundations at 9 Valley and 1260 Gordon were assessed on July 5, 2018. 1250 Gordon and 1242 Gordon (occupied) were assessed on November 23, 2018. Incidental surveys completed on April 26, 2018; June 12, 13, 14, 29, 21, 25, 26; July 5; September 11, 2018.
Deer Movement Studies	November - January	Cameras to be installed November 1, 2018 and will run until the end of January 2019.
Wildlife Habitat Assessment, including SAR and SOCC.	Preliminary assessment April 26, subsequent assessment June	Completed on April 26 and June 12, 2018.
Additional Wildlife Observations	Completed during each site visit	Completed on April 26, 2018; June 12, 13, 14, 29, 21, 25, 26; July 5; September 11, 2018.

Field surveys will be conducted where property access had been granted (i.e., Subject Property). Where access is not available (i.e., within the Study Area but outside the Subject Property), alternate site investigations were conducted using observations recorded from the property boundary. The field information collected from review and approval agencies will be used to characterize the natural features and ecological functions within the Study Area.

An aquatic watercourse habitat assessment is not required as there are no defined watercourses within 120 metres of the Subject Property.

Hydrogeological Investigation

The hydrogeological field data collection program will consist of the following:

- Installation of five single and two multi-level (i.e., shallow and deep) groundwater monitoring wells throughout the Subject Property
- Installation of drive-point piezometers (up to two) into the portion of Torrance Creek Swamp located northeast of the Subject Property (if access to these lands granted by land owner)
- Continuous monitoring of seasonal groundwater level fluctuations and gradients in each monitoring well and drive-point piezometer using Solinst® LT Leveloggers®
- Perform in-situ hydraulic response testing on each of the monitoring wells to develop a better understanding of the horizontal hydraulic conductivity of the subsurface deposits

- Collection of groundwater samples from selected monitoring wells for pre-development quality analysis.

The hydrogeological report will include, as a minimum:

- A description of the existing geological/hydrostratigraphic conditions and seasonal positioning of the groundwater table beneath the Subject Property.
- An evaluation of the hydraulic relationship between the groundwater system present beneath the Subject Property and the adjacent wetlands and assess whether the future development of the Subject Property could potentially disrupt the hydrological and hydrogeological form and/or function of these wetlands.
- The completion of a monthly pre- and post-development water balance (to be completed as part of stormwater management report) to evaluate potential land use change impacts to the groundwater recharge function of the Subject Property, including assessing the feasibility of employing Low Impact Development (LID) stormwater infiltration techniques at the Subject Property to mitigate lost groundwater recharge potential.
- The completion of a groundwater dewatering assessment to determine whether dewatering efforts (if required) will require a Ministry of the Environment, Conservation and Parks (MECP) Permit to Take Water (PTTW) or Environment Activity and Sector Registry (EASR).
- An assessment of whether underground servicing will intercept the groundwater table and determine if any measures are required to mitigate potential disturbances on pre-development groundwater elevations and flow patterns.

Wetland and Woodland Delineations

The Torrance Creek Swamp PSW is present in the Study Area but outside of the Subject Property based on background LIO mapping (**Figure 2, Attachment A**). Information provided by the City of Guelph in their September 12, 2018 review indicated that the boundaries of the PSW were delineated by the GRCA in 2014. These stakes remain in the field and were re-captured in 2018 (see **Figure 2, Attachment A**), however, the statute for wetland boundary delineations is 5 years. Therefore, the GRCA will be contacted in 2019 to re-confirm the boundary.

In addition, the City of Guelph OP (2018) has identified the adjacent white cedar forested area as locally significant wetland (Schedule 4A). As per General Policy 4.2.1 (2) mapping associated with the Natural Heritage System may be refined or updated through more detailed information provided in the EIS. The inclusion of this portion of upland forest as locally significant wetland will be discussed in the field with City and GRCA staff and addressed in the EIS.

Also, in 2014, the boundary of the woodland was staked in the field with the City of Guelph. This woodland boundary will be updated in 2019.

Vegetation

Vegetation surveys were initiated in spring, 2018. Survey methods are detailed below.

Vegetation Communities

Vegetation communities were mapped and described (including soils) using the Ecological Land Classification (ELC) field guide for southern Ontario (Lee et al. 1998). Updates to vegetation community names and codes followed the 2008 catalogue of ELC vegetation communities. Scientific nomenclature of plant species will follow Brouillet et al. (2010+, accessed 2018). Mapping was completed to the finest level of resolution (vegetation type) where possible. Vegetation communities were first be identified on aerial imagery and then checked in the field. Provincial significance of vegetation communities will be based on the rankings assigned by the Natural Heritage Information Centre (MNRF 2018b). Vegetation mapping for the Subject Property and surrounding Study Area was completed in conjunction with seasonal botanical inventories.

Vascular Plants

A three-season botanical inventory was completed in 2018 to consider late spring (June), early summer (July) and fall (September), timing windows. Early spring surveys were not proposed in the original ToR due to a perceived lack of habitat (i.e., undisturbed deciduous woodlots) where early spring ephemeral vegetation would be expected on the Subject Property. Furthermore, 2018 experienced a late April ice storm and as such spring flower emergence was also delayed. Therefore, the early June date for the spring botanical inventory was considered appropriate.

Plant species status will be considered and evaluated using the Rare Vascular Plants of Ontario, Fourth Edition (Oldham and Brinker 2009) for provincial significance; provincial and federal status will reference the Species at Risk List Ontario (SARO). Identification of potentially sensitive native plant species will be determined based on their assigned coefficient of conservatism (CC) value, as determined by Oldham et al. (1995). CC values range from 0 (low) to 10 (high) based on a species' tolerance of disturbance and fidelity to a specific natural habitat. Species with a high CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters. Locally significant species will be based on L*ocally Significant Species List – City of Guelph 2002,* with recent records for Meadow Horsetail (*Equisetum pretense*) in the Torrance Creek Subwatershed.

Tree Inventory and Preservation Plan

A detailed tree inventory of trees ≥ 10 cm DBH on the Subject Property, as well as any trees with crowns within 6 m of property lines will be completed, by a certified arborist. Details will be provided on:

- tree number
- tree species (common and scientific name)
- diameter at breast height

- crown diameter
- condition and health,
- fate (e.g., retain, transplant, or remove) and rationale

The tree inventory and preservation plan will be completed in consideration of Appendix G of the City's EIS guidelines (City of Guelph 2014) and will including a drawing, location of tree protection fencing, and compensation at a rate of 3:1 (or cash in lieu of $500/tree) where preservation is not possible.

Wildlife and Wildlife Habitat Assessment

Wildlife and wildlife habitat assessment surveys to consider habitat of SAR and SOCC as well as SWH features are detailed below.

Amphibian Surveys

Amphibian call count surveys were conducted in accordance with the guidelines provided by the Marsh Monitoring Program manual (Bird Studies Canada and Environment Canada, 2008). No wetland communities were identified on the Subject Property; however, locally significant and provincially significant wetlands are associated with the Torrance Creek Swamp PSW. Breeding amphibian surveys were conducted to target the Torrance Creek Swamp PSW. Surveys were conducted 30 minutes after sunset and no later than midnight on nights with light or no winds with the following nighttime air temperatures:

- April >5°C
- May > 10°C
- June > 17°C

A spring survey was conducted on May 7. This survey was conducted to target the early breeding amphibian window for April, but due to cold spring temperatures, this survey was moved to early May. No amphibian calls were recorded. Subsequently, a survey of the site to identify suitable amphibian breeding habitat was conducted on May 28. No suitable breeding amphibian habitats were identified. As such, subsequent breeding amphibian surveys were not completed in late May or June due to absent breeding amphibian habitat on the Subject Property and Study Area. In addition, no amphibian calls were recorded during evening bat exit surveys (Section 4.2.4.2) in June on or adjacent to the Subject Property.

Bat Habitat and Exit Surveys

Bat Habitat Assessment (trees and buildings)

Bat roosting habitat may occur in the buildings and mature trees on the Subject Property and in the forested area (Torrance Creek Swamp PSW) in the Study Area. Buildings were assessed for entry/exit points for bats. As suitable bat roosting habitat was determined to potentially occur in the onsite buildings, they were surveyed twice in June using bat exit surveys following established protocol (MNR 2013; discussed below).

Large mature trees were assessed in early June to identify a) trees ≥10 cm diameter at breast height (DBH) with cavities, cracks, or peeling bark that may support Little Brown or Northern Myotis roosting and b) any oaks ≥ 10 cm DBH, maples ≥ 10 cm DBH with dead leaf clusters, or any maple ≥25 cm DBH to support Tri- coloured Bat, in accordance with established protocols (MNRF 2017).

Isolated snags were identified in proximity to the residential areas (outside of the forested areas) during habitat assessments. This triggered exit surveys at these trees under MNR 2013, discussed below.

Large maples (> 25 cm DBH) were identified on the Subject Property, therefore triggering acoustic surveys for Tri-coloured Bat of the forested areas. Snags were assumed present for Little Brown and Northern Myotis, which would also trigger acoustic surveys in the forested area, methods for which are discussed below.

Bat Exit Survey (trees and buildings)

As potentially suitable bat roost habitat was identified on the Subject Property, acoustic surveys were completed in June 2018. This consisted of exit surveys at the buildings and isolated snag trees identified as well as automated acoustic recordings placed in the forested areas.

Building and isolated trees identified during the habitat assessment as shown on **Figure 3** (**Attachment A**) were surveyed in accordance with *Surveying for the presence of Little Brown Myotis and Northern Myotis* (MNR, June 2013). This consisted of observers watching the identified buildings and trees looking for signs of bats exiting or entering the buildings and/or trees using binoculars and flashlights, as well as use of an acoustic monitoring device to record bat calls for species identification. Surveys started 30 minutes before dusk and finished 60 minutes after dusk.

Automated acoustic recording devices were placed in the forest community for a minimum of 10 nights. Recorded calls were identified where possible to species or group of similar species using Kaleidoscope and quality reviewed by a qualified ecologist. The locations of the automated acoustic records are provided on **Figure 3** (**Attachment A**).

Breeding Bird Surveys

Diurnal Surveys

Two breeding bird surveys were conducted on the Subject Property in June and July 2018 in accordance with the Breeding Bird Atlas (Cadman et al., 2007). Fieldwork was conducted at, or within, half an hour of sunrise, and completed by 10:00 a.m. and under favorable weather conditions.

Surveys consisted of recording all species of birds that were seen or heard within each habitat while traversing the Subject Property. A conservative approach to determining breeding status was taken; all birds seen or heard in appropriate habitat during the breeding season was assumed to be breeding.

Crepuscular Surveys

Crepuscular surveys for Common Nighthawk (*Chordeiles minor*) were conducted in conjunction with bat exit surveys in June. Surveys began at sunset and occurred on calm, clear, and warm evenings (>10˚C). All birds seen or heard during evening bat surveys were recorded.

Woodland Raptor Nest Survey

Surveys for woodland raptors were undertaken in late May and early June by systematically searching the forested portion of the Subject Property and adjacent PSW for stick nests as well as recording any observations (auditory or visual) of any raptor species during spring surveys.

Terrestrial Crayfish

Terrestrial crayfish surveys were conducted by systematically searching for their distinctive chimneys within 100 m of the wetland boundary (as shown on **Figure 3**, **Attachment A**) during all vegetation and breeding bird surveys conducted on the Subject Property.

Snake Surveys

Snake habitat, including hibernacula features such as underground foundations, cracks and crevices and stone piles, were assessed. As hibernacula require access to below the frost line to be considered candidate significant wildlife habitat, this was assessed for buildings on the Subject Property. Snake observations were recorded (if applicable) during all surveys (May-September).

Deer Movement Study

Five wildlife cameras will be used to obtain information deer movement activity on the Subject Property. Cameras will be installed in early November, deployed until the end of January. This timing is proposed to capture movement into the known overwintering area (as shown on **Figure 2**, **Attachment A**) and is consistent with deer movement studies undertaken along this corridor to the east. Camera deployment locations are shown on **Figure 3** (**Attachment A**) and were chosen to address camera visibility, north-south and east-west movement opportunities, and acknowledges feedback from EAC on September 12, 2018. Additional correspondence between Stantec (Melissa Straus) and City staff (Leah Lefler) was undertaken so that studies could begin within the proposed time frame, with City approval of the proposed approach provided on October 19, 2018 (**Attachment B**).

Other Wildlife Observations

All direct wildlife observations were recorded during every site visit.

Rare species (i.e., ranked S1-S3 in the province), species of conservation concern (i.e., designated as Special Concern in the province), and locally rare species (i.e. on Locall*y Significant Species List – City of Guelph 2002*) were surveyed using the methods previously described above, where background records indicate species may be present. Habitat assessments were completed on the Subject Property in conjunction with vegetation surveys and during the wetland assessment at the end of May to determine suitability of the Subject Property to support rare species. Specific presence/absence surveys were undertaken for rare birds (breeding bird surveys), locally significant amphibians (e.g., western chorus frog and American bullfrog; amphibian surveys) with incidental survey methods implemented for rare reptiles and mammals during all survey dates. Surveys undertaken on the Subject Property cover the range of active and breeding periods of the target species.

Habitat for Species at Risk

This section will combine a background records review of historic records of Species at Risk (i.e., designated as Threatened or Endangered by COSSARO) that may potentially occur in the Study Area, and cross referenced with existing habitat on and adjacent to the Subject Property. Consultation with the MNRF identified a number of potential species at risk occurring generally within the City of Guelph, none within the Study Area. As recommended, a screening exercise was undertaken to determine if species-specific surveys are required.

Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is defined in the Significant Wildlife Habitat Technical Guide (MNR, 2000) as: seasonal concentrations of wildlife; rare vegetation communities or specialized habitat for wildlife; habitat for species of conservation concern; and wildlife movement corridors. The Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF, 2015) provides further descriptions of wildlife habitats and guidance on criteria for determining the presence of candidate and confirmed wildlife habitats. Determination of presence or absence of these habitats in the Study Area is discussed below.

Seasonal concentration areas are sites where large numbers of a species gather together at one time of the year, or where several species congregate. Only the best examples of these concentration areas are typically designated as SWH.

Rare or specialized habitats are defined as separate components of SWH. Rare habitats are habitats with vegetation communities that are considered rare (S1-S3) in the province. These habitats are generally at risk and may support wildlife species that are considered to be significant. Specialized habitats are microhabitats that are critical to some wildlife species.

Habitat for species of conservation concern includes four types of species: those that are rare; those whose populations are significantly declining; those that have been identified as being at risk to certain common activities; and those with relatively large populations in Ontario compared to the remainder of the globe.

Animal movement corridors are distinct passageways or defined natural features that are used by wildlife to move between habitats. Movement is usually in response to different seasonal habitat requirements.

A Significant Wildlife Habitat Screening Table (**Table 1**) as requested in the City of Guelph EIS Draft Guidelines (2014) is provided below. Where candidate SWH was identified in the Study Area field surveys were or are being conducted where access allows as detailed in the table below.

Table 1: City of Guelph Significant Wildlife Habitat Screening Table

SWH Type	SWH Features	Known candidate SWH present?	Field Studies Required?
SEASONAL CONCENTRATION AREAS			
Waterfowl Stopover and Staging (Terrestrial & Aquatic)	Field with evidence of annual spring flooding from meltwater or runoff; aquatic habitats such as ponds, marshes, lakes, bays, and watercourses used during migration, including large marshy wetlands	No areas of spring flooding, large open aquatic features or wetlands.	No - Suitable habitat not present.
Shorebird Migratory Stopover Area	Beaches and un-vegetated shorelines of lakes, rivers, and wetlands	No beaches, shorelines, lakes, rivers or open wetlands.	No - Suitable habitat not present.
Raptor Wintering Area	Combination of fields and woodland (>20 ha)	No suitable open fields present adjacent to wooded area.	No - Suitable habitat not present.
Bat Hibernacula	Abandoned mine shafts, underground foundations, caves, and crevices	No caves, mine shafts, underground formations or Karsts.	No - Suitable habitat not present.
Bat Maternity Colonies	Mixed and deciduous forests and swamps with large diameter dead or dying trees with cavities	cSWH present in forest, swamp and large trees on and adjacent to the Subject Property.	Yes - Bat habitat and exit surveys completed.
Turtle Wintering Areas	Permanent waterbodies and large wetlands with sufficient dissolved oxygen	No permanent waterbodies or watercourses.	No - Suitable habitat not present.
Reptile Hibernaculum	Rock piles or slopes, stone fences, crumbling foundations	House foundations on the Subject Property required assessment to determine accessibility for reptiles below the frostline and therefore candidacy. cSWH was not identified	Yes - Buildings inspected to determine if structures are suitable for reptile overwintering. No - species surveys not required as cSWH was not identified.

Table 1: City of Guelph Significant Wildlife Habitat Screening Table

SWH Type	SWH Features	Known candidate SWH present?	Field Studies Required?
Colonially – nesting bird breeding habitat (bank and cliff)	Eroding banks, sandy hills, steep slopes, rock faces or piles	No steep banks or slopes	No - Suitable habitat not present.
Colonially – nesting bird breeding habitat (trees/shrubs)	Dead trees in large marshes and lakes, flooded timber, and shrubs, with nests of Great Blue Heron, Great Egret, Green Heron, or Black-crowned Night-Heron	No large marshes and/or lakes.	No - Suitable habitat not present.
Colonially – nesting bird breeding habitat (ground)	Rock islands and peninsulas in a lake or large river	No lakes or rivers.	No - Suitable habitat not present.
Migratory Butterfly Stopover Area	Fields and forests that are a minimum of 10 ha and are located within 5km of Lake Erie or Lake Ontario	Subject Property is not located within 5km of Lake Erie or Lake Ontario.	No - Suitable habitat not present.
Landbird migratory stopover area	Woodlands of a minimum size located within 5km of Lake Erie or Lake Ontario	Subject Property is not located within 5km of Lake Erie or Lake Ontario.	No - Suitable habitat not present.
Deer Yarding Areas and Wintering Congregation Areas	Deer yards are mapped by MNRF	Deer wintering area identified through MNRF mapping on and adjacent to the Subject Property.	No – areas of deer wintering are mapped based on NHIC, LIO information
Rare Vegetation Communities			
Alvar	None	None.	Yes - confirmed during ELC and botanical surveys.
Prairie			
Savannah			
Rare Forest Types			
Cliff/Talus			
Rock Barrens			
Sand Barrens			
Other Rare Vegetation Types			

Table 1: City of Guelph Significant Wildlife Habitat Screening Table

SWH Type	SWH Features	Known candidate SWH present?	Field Studies Required?
SPECIALIZED HABITATS FOR WILDLIFE			
Waterfowl Nesting Area	Upland habitats adjacent to wetlands (within 120m)	Upland habitat adjacent to the Torrance Creek Swamp PSW is highly disturbed (lawn).	No – Suitable habitat not present
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	Treed communities adjacent to rivers, lakes, ponds, and other wetlands with stick nests of Bald Eagle or Osprey	No waterbodies present	No – Suitable habitat not present
Woodland Raptor Nesting Habitat	Forested ELC communities >30 ha with 10 ha of interior habitat	Large tract of conifer woodland/wetland present	Yes – Subject Property and where possible the Study Area was assessed during ELC surveys
Turtle Nesting Habitat	Exposed soil, including sand and gravel in open sunny areas in proximity to wetlands	No permanent water bodies in the Study Area.	No – Suitable habitat not present
Seeps and Springs	Any forested area with groundwater at surface within the headwaters of a stream or river system	Unknown	Yes – Study Area to be assessed during ELC surveys
Amphibian Breeding Habitat (Woodland, Wetland)	Treed uplands with vernal pools, and wetland ecosites	No vernal pools or standing water in wetland communities	Yes – habitat assessment and call count surveys if suitable habitat present.
Woodland Area-Sensitive Bird Breeding Habitat	Large mature forest stands, woodlots >30ha	Large tract of conifer woodland/wetland present Confirmed in PSW as per previous EISs	Yes – breeding bird surveys in forested area
WILDLIFE MOVEMENT CORRIDORS			
Animal Movement Corridors (including ecological linkages) Amphibian Movement Corridors	Wildlife crossings identified on City of Guelph OP (Schedule 4) in Study Area	Deer movement corridors absent (determined by the MNRF). - No amphibian breeding habitat	Yes –trail cameras installed in fall 2018 to capture deer movement into overwintering areas on the Subject Property.

Table 1: City of Guelph Significant Wildlife Habitat Screening Table

SWH Type	SWH Features	Known candidate SWH present?	Field Studies Required?
Deer Movement Corridors		- Deer wintering area present on Subject Property and in the Study Area - Two locally significant deer movement corridor identified in Study Area crossing Gordon Street as per the City's OP - Deer movement occurs along the edge of the PSW, as identified by the City through other EISs	
HABITATS OF SPECIES OF CONSERVATION CONCERN			
Marsh Bird Breeding Habitat	Wetlands with shallow water with emergent aquatic vegetation	Habitat not present	No
Woodland Area-Sensitive Breeding Habitat	Large forested areas (>30ha) with a minimum of 10ha interior habitat	Torrance Creek Swamp PSW may provide habitat for woodland area-sensitive breeding birds.	Yes – breeding bird surveys in forested area
Open Country Bird Breeding Habitat	Large grasslands and fields (>30ha)	Habitat not present	No
Shrub/Early Successional Breeding Bird Habitat	Large shrub and thicket habitats (>10ha)	Habitat not present	No
Terrestrial Crayfish Habitat	Wet meadows and edges of shallow marshes	Potential habitat in or directly adjacent to the Torrance Creek Swamp PSW.	Yes – incidental observations of terrestrial crayfish will be recorded during all field investigations.
Global Species of Conservation Concern as identified by the NHIC	None identified by NHIC.	Potential habitat absent.	No.
Species of Conservation Concern and Rare Wildlife Species	Background review and MNRF records to identify	Unknown	Yes - habitat assessment for species identified as potentially present in the

Table 1: City of Guelph Significant Wildlife Habitat Screening Table

SWH Type	SWH Features	Known candidate SWH present?	Field Studies Required?
	SOCC occurring in the vicinity of Study Area. Additional records and consultation provided by MNRF.		Study Area. Wildlife and habitat surveys (reptiles, birds, bats) to identify/support assessment of presence/absence of species.

Trails and Park Planning

Detailed design is still ongoing for the proposed development. Once refined, an area will be identified for the development of an open space block, park block, road right-of-way and development block. Basic trail design will be completed. The EIS will assist in determining the areas of least impact for the trail and park locations.

DATA ANALYSIS

EVALUATION OF SIGNIFICANCE

The data obtained from the field investigations and review of background resources will be evaluated to determine sensitivity of features and functions. The criteria for determining significant features and functions will be evaluated according to the following documents:

- Provincial Policy Statement (2014)
- Natural Heritage Reference Manual (2010)
- Significant Wildlife Habitat Technical Guide (2000)
- Significant Wildlife Habitat Criteria Schedules for EcoRegion 6E (2015)
- City of Guelph Official Plan (2018)

This section will evaluate all identified natural heritage features and areas and associated ecological functions within the Study Area. The areas/features identified will be screened against the applicable policies and guidelines to confirm their significance in the City of Guelph.

With respect to SWH features, the EIS will include an evaluation of significance for SWH and habitat of significant species. Locally significant species will also be considered in the analysis. These will be considered and assessed in the impact section of the EIS and mapped, as appropriate.

CONSTRAINTS AND OPPORTUNITIES

A constraints and opportunities figure will be derived from the evaluation of significance summary, illustrating the boundaries of natural features, areas for development, areas for protection, natural hazards and buffers/setbacks. The constraints and opportunities analysis will identify opportunities for development on the Subject Property that work within the limitations of the site-specific constraints, and opportunities to improve the existing conditions of the natural heritage system, where possible.

The buffer analysis will involve consideration of expanded buffers where natural feature attributes warrant a greater area of protection.

IMPACT ASSESSMENT

The significant natural features identified in the evaluation of significance will need to be protected from the proposed development. These features will be evaluated for potential impacts from construction and grading, stormwater management, erosion and sediment control, noise, salt application, the trail, and other development related impacts.

The EIS will incorporate the results of the hydrogeological assessment, particularly regarding the potential impacts to the wetlands from the proposed development and those methods that can be employed at the Subject Property to mitigate these impacts.

This section will also provide a summary of impacts that could be experienced by the Torrance Creek Swamp PSW and associated ecological functions as a result of the proposed development activity.

The primary management approach to mitigate impacts on significant and sensitive natural features is to identify and avoid site-specific constraints to the extent possible.

MITIGATION

Where impacts are unavoidable, mitigation measures to reduce or minimize impacts on features will be recommended.

This section will include an analysis of buffers and setbacks, a description of proposed compensation for impacts that cannot be mitigated (if applicable), restoration plans for disturbed areas and measures proposed to reduce, eliminate or off-set impacts.

Where possible, processes for the restoration and enhancement of natural features will be recommended to encourage a net benefit. Mitigation measures considered for the Subject Property may include, but are not limited to the following:

- Low Impact Development (LID) measures
- Stormwater management best practices

- Educational signage
- Sediment and erosion controls
- Location of fill piles, construction access, machinery storage
- Tree protection fencing and signage
- Timing windows for vegetation removal
- Trail alignment and best management practices
- Implementation of appropriate buffers and setback distances from natural hazards and heritage features
- Naturalization and tree planting in areas on the Subject Property
- Potential linkages between natural heritage features
- Recommendations for inclusion in the future Environmental Implementation Report (EIR) will also be provided

POLICY CONFORMITY

The relevant provincial, regional, municipal and conservation authority natural heritage policies and regulations will be reviewed. The proposed development plan will adhere to and respect the relevant natural heritage policies.

MONITORING PLAN

This section will describe the proposed monitoring procedure to facilitate and confirm the recommended mitigation measures have been implemented in accordance with approved development plans.

Monitoring plans may include a combination of compliance monitoring, performance monitoring and/or effectiveness monitoring. Monitoring protocols will be established to standardize the procedures to confirm findings can be compared over a set time.

The following monitoring plans will be considered:

- Monitoring during all phases of construction:
    - compliance with grading, erosion and sediment controls
    - construction encroachment not to occur outside the marked limits
    - retain identified trees

- Submission of compliance monitoring reports to the City of Guelph while the Subject Property is being actively developed, including log of dates of inspections, condition of facilities and any recommended remedial actions
- SWM and LID design monitoring post-construction
- Qualitative vegetation monitoring plan following the implementation of any rehabilitation plans (if applicable) to monitor the survival of any plantings
- Species at Risk monitoring (if deemed applicable through consultation with the MNRF)

CONCLUSION AND RECOMMENDATIONS

The conclusion will include a summary of all recommendations emerging from the EIS, and identification of (if any) negative impacts associated with the proposed development after mitigation measures have been employed. Relevant environmental policies associated with the proposed development, and if these policies can or cannot be conformed to, will also be provided.

Regards,

STANTEC CONSULTING LTD

Melissa Straus

Melissa Straus M.Sc.
Terrestrial Ecologist
Phone: (519) 780-8103
melissa.straus@stantec.com

Daniel Eusebi

Daniel Eusebi BES, MCIP, RPP
Senior Environmental Planner
Phone: (519) 780-8134
dan.eusebi@stantec.com

Attachment: A	Figures
Attachment B:	Consultation

\\cd1217-f01\work_group\01614\active\161413684\planning\report\environmental\eis_tor\20190109_v2\eis_tor_1250gordon_20181118_v2_20190121_fnl.docx

REFERENCES

Cadman, M. D., D.A. Sutherland, G.G. Beck, D. Lepage, A.R. Couturier. 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. (eds) Bird Studies Canada, Environment Conada, Ontario Field Ornithologists, Ontario Ministry of natural resources, and Ontario Nature, Toronto, xxii + 318pp

City of Guelph. 2014. Guidelines for the Preparation of Environmental Impact Studies.

Ministry of Natural Resources (MNR). 2013. Use of Buildings by Little Brown Myotis and Northern Myotis-Survey Methodology.

Ministry of Natural Resources and Forestry (MNRF). 2017. Survey Protocol for Species at Risk Bats within Treed Habitats. Little Brown Myotis, Northern Myotis & Tri-Colored Bat. Guelph District. 13 pp.

Ministry of Natural Resources and Forestry. 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E.

ATTACHMENT A:

Figures

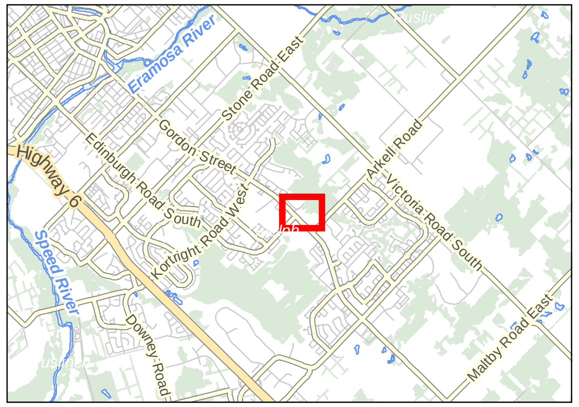
Stantec

Legend
▢ Study Area (120 m)
🟥 Site Boundary
— Watercourse (Permanent)

0 25 50 Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Service Layer Credits: © 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution Airbus DS Image Date: Unknown



Project Location
City of Guelph

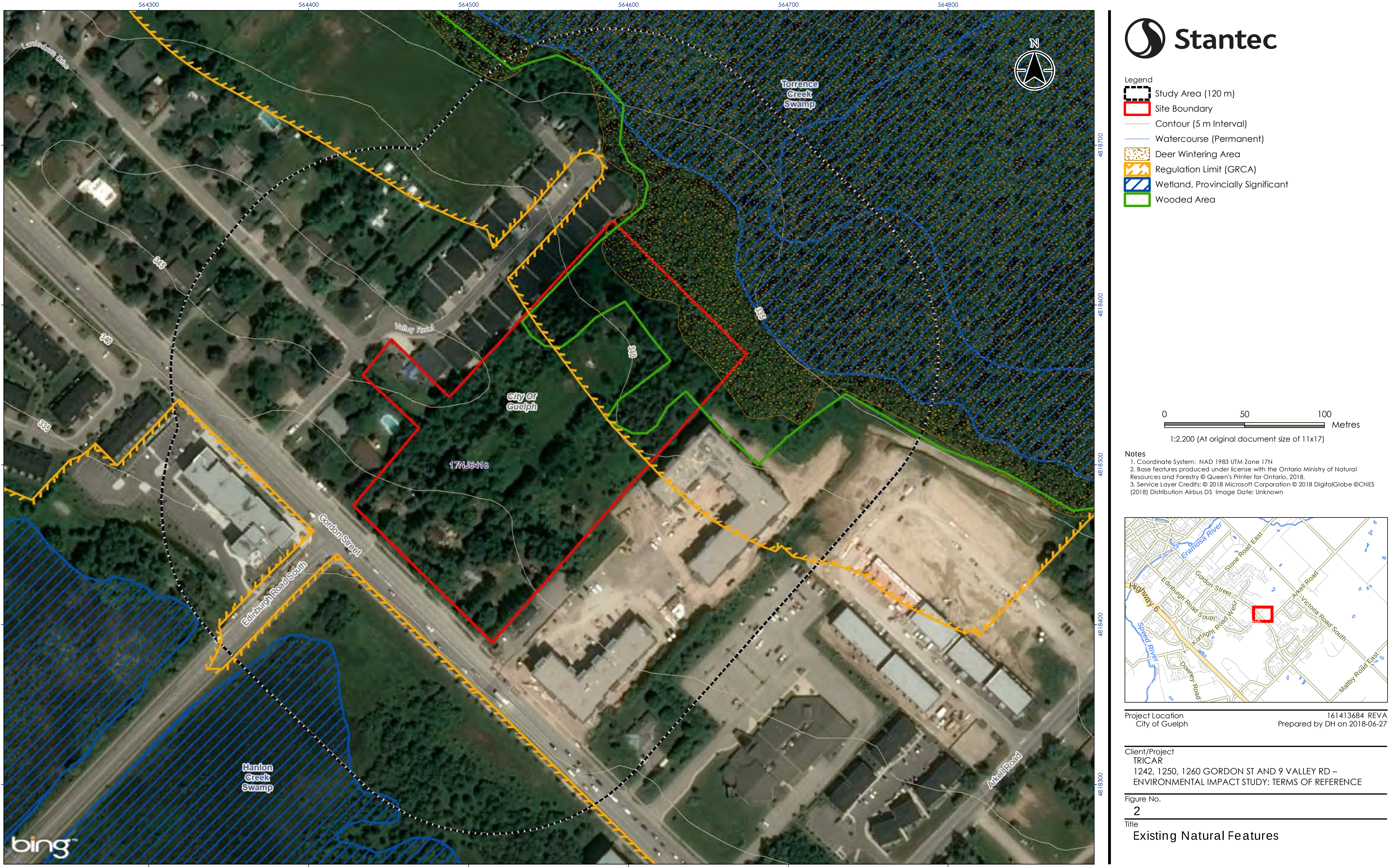
161413684
Prepared by DH on 2018-06-27

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD –
ENVIRONMENTAL IMPACT STUDY: TERMS OF REFERENCE

Figure No.
1

Title
Project Location and Study Area

\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413648\03_data\gis_cad\Figures\Terrestrial\ReportFigures\Term_of_Reference\161413684_Fig_1_Project_Location_Study_Area.mxd Revised: 2018-06-27 By: dharvey



Stantec

Legend
- ⬚ Study Area (120 m)
- 🟥 Site Boundary
- — Contour (5 m Interval)
- — Watercourse (Permanent)
- ▨ Deer Wintering Area
- ▨ Regulation Limit (GRCA)
- ▨ Wetland, Provincially Significant
- 🟩 Wooded Area

0 50 100 Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Service Layer Credits: © 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution Airbus DS Image Date: Unknown

Project Location
City of Guelph

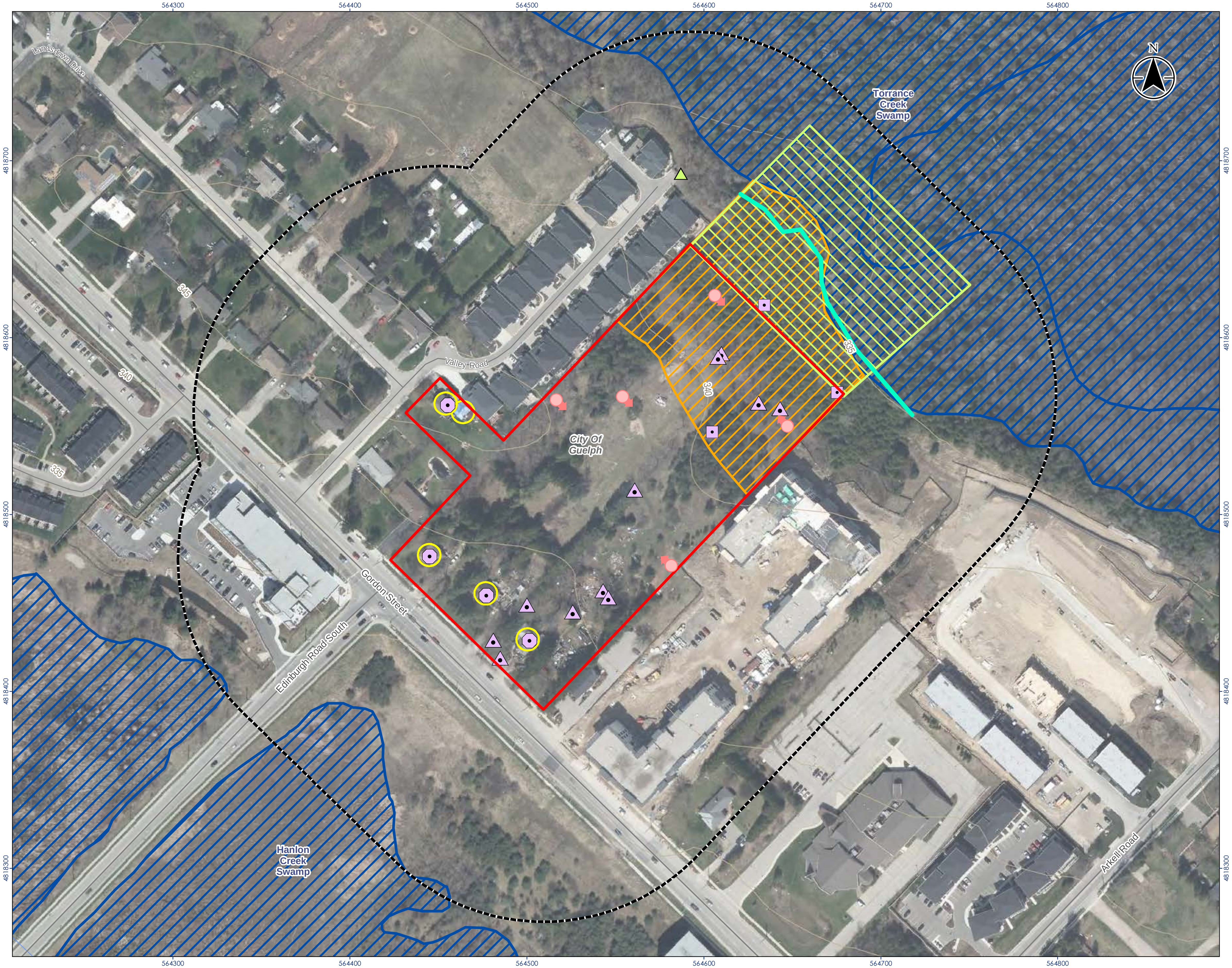
161413684 REVA
Prepared by DH on 2018-06-27

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD –
ENVIRONMENTAL IMPACT STUDY: TERMS OF REFERENCE

Figure No.
2

Title
Existing Natural Features

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\Report\Figures\Term_of_Reference\161413684_Fig_2_Existing_Natural_Features.mxd Revised: 2018-06-27 By: dharvey



Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\ReportFigures\Term_of_Reference\161413684_Fig_3_SurveyLocations_20181010.mxd Revised: 2018-10-18 By: dharvey

Stantec

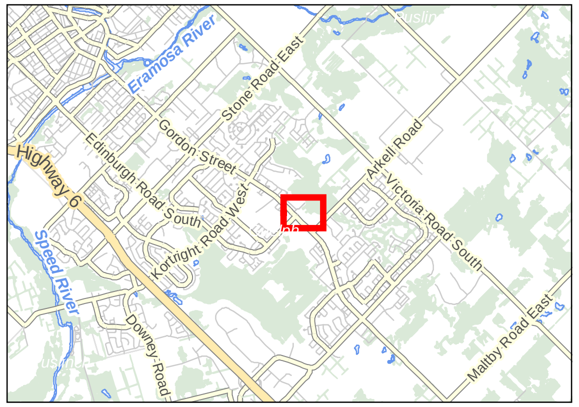
Legend
- ⬚ Study Area (120 m)
- 🟥 Site Boundary
- △ Amphibian Survey Location
- ○ Snake Habitat Assessment
- ● Proposed Trail Camera Location
- — Contour (5 m Interval)
- ▨ Amphibian Habitat Assessment
- ▨ Terrestrial Crayfish Survey Area
- — Approximate GRCA Wetland Boundary (2014)
- — Watercourse (Permanent)
- ▨ Wetland, Provincially Significant

Bat Acoustic Survey
- ▣ Automated
- ⬢ Building
- △ Snag

0 50 100
Metres

1:2,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2017.



Project Location
City of Guelph

161413684 REVA
Prepared by DH on 2018-10-18

Client/Project
TRICAR
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD –
ENVIRONMENTAL IMPACT STUDY: TERMS OF REFERENCE

Figure No.
3

Title
Survey Locations

ATTACHMENT B:

Consultation

September 12, 2018
Environmental Advisory Committee

Item

1242, 1250 and 1260 Gordon Street and 9 Valley Road, Environmental Impact Study Terms of Reference

Proposal

High density residential development is proposed at 1242, 1250 and 1260 Gordon Street, 9 Valley Road. At this time the applicant proposes to develop the site with two 12-storey apartment buildings with surface and below grade parking. A pre-consultation meeting between the applicant and City staff has not yet occurred and further development of the concept plan is expected at that time.

Note that a Terms of Reference for an Environmental Impact Study (EIS) for a previous development at 1242, 1250 and 1260 Gordon Street, 9 Valley Road was reviewed by the Environmental Advisory Committee in January, 2015.

Location

The subject lands are approximately 2.98 hectares in size, and are located on the east side of Gordon Street, immediately south of Valley Road (Attachment 1).

Background

There is a topographical divide on the subject lands, which fall partially within the Hanlon Creek Subwatershed and partially within the Torrance Creek Subwatershed.

In the Official Plan the lands are designated as Significant Natural Areas and Natural Areas, Medium Density Residential and General Residential. The Natural Heritage System attributes are identified as Provincially Significant Wetland (PSW), Significant Woodland, Significant Wildlife Habitat (Deer Wintering Habitat). In addition, a deer crossing is associated with the Significant Natural Area across Gordon Street in the vicinity of 1250 Gordon Street. Provincially Significant Wetlands and Significant Woodlands were staked in the field with GRCA and City staff on October 17, 2014 as part of a previous application.

The properties are currently zoned Single Detached R.1B with shading to illustrate lands adjacent to PSW and lands with one of the following: Significant Woodlands, Locally Significant Wetlands, Natural Corridor or Linkage. The subject lands currently consist of woodlands, PSW buffer, residential homes, sheds, manicured lawn and trees.

Park Planning is reviewing the EIS TOR and comments are forthcoming. Note that the Guelph Trail Master Plan identifies a proposed trail connection through these lands. Through previous planning efforts, a desire for a park to be located on the subject lands has been identified.

GRCA is reviewing the EIS TOR and comments are forthcoming.

Comments

Environmental Planning staff reviewed the EIS TOR and provide the following comments:

- The EIS TOR should indicate that the lands fall partially within the Hanlon Creek Subwatershed and partially within the Torrance Creek Subwatershed. Subwatershed studies completed for these subwatersheds include targets and recommendations that will need to be considered through the EIS.
- Due to proximity to the PSW the hydrology of the wetland should be characterized and an associated water balance for the natural feature should be prepared as part of a Hydrogeological Report to support the EIS, in addition to the water budget that forms part of the SWM report. This should include consideration for any ground water impacts as a result of underground parking where proposed. Incorporation of Low Impact Development (LID) as part of the stormwater management approach is also encouraged.
- The EIS TOR indicates that field studies are required to delineate the wetland boundary. Note that delineation of the woodland boundary is also required, and may not necessarily coincide with the PSW.

Preliminary Screening Assessment for Significant Wildlife Habitat (SWH)

- April 2017 guidance from the MNRF Guelph District on survey protocols for identifying suitable maternity roost trees indicate that surveys should be completed during leaf-on condition for Tri-colored Bat (*Perimyotis subflavus*) which roost in dead/dying leaves along a dead branch, and during leaf-off condition for Little Brown Myotis/Northern Myotis (*Myotis* lucifugus/*M. septentrionalis*) which roost in tree hollows and cracks. Field surveys are proposed in May to assess Bat Roost Habitat, and should also be proposed during leaf-off condition. Note that surveys in May should be completed in late May to ensure that leaves have in fact developed.
- Note that where surveys for SWH are not proposed, staff expect a conservative approach to be taken in the EIS which acknowledges candidate SWH and identifies constraints based on the precautionary principle.
- The EIS TOR indicates that candidate SWH is present for Reptile Hibernaculum. Clarification is needed as to what field surveys for wildlife habitat assessment entail. It is unclear whether or not snake exit surveys and/or snake surveys are proposed.
- Candidate SWH is also identified for Woodland Raptor Nesting Habitat. Clarification is needed as to whether or woodland raptor nesting surveys are proposed as part of surveys for wildlife habitat.
- Note that deer movement occurs along the edge of the PSW (as observed through other EISs) as well as across Gordon Street (as indicated in the Natural Heritage Strategy). Table 1 should be updated to reflect this information.

EIS Field Surveys

- Location of field surveys, such as breeding bird point count locations and amphibian monitoring stations should be provided on a study area map.
- Staff request that movement of deer be studied on the subject lands using wildlife cameras to assess movement in the east-west and north-south direction.
- Clarification on the timing (e.g., spring emergence, first/second breeding bird window, etc.) conditions and search effort proposed for wildlife surveys, species of special concern and rare species searches.
- Vegetation community mapping should also indicate woodland staking.
- Spring botanical inventories should ideally be completed in early May. Waiting until June will miss early spring ephemerals, which will have senesced by June.
- Vegetation community descriptions should include description of soils, per the ELC protocol.
- Table 1 indicates that incidental observations of terrestrial crayfish will be recorded. Clarify where searches for terrestrial crayfish will be performed (i.e. target habitats).
- Regarding Species of Conservation Concern/Locally Rare Species, it should be noted that City records show that American Bullfrog (*Lithobates catesbeianus*) and Meadow Horsetail (*Equisetum pratense*) have been recently documented in the Torrance Creek PSW.
- Section 4.2.1.2 Vascular Plants should be revised to indicate that three-season botanical inventory will be completed.
- Note that formal wetland boundary and woodland boundary delineation with agencies is required.

Tree Inventory and Preservation Plan

- The subject lands are regulated under the City's Private Tree By-law and any tree removals will require authorization from the City. The EIS should inform the development application and should look for opportunities to retain trees and integrate them into the development proposal, where feasible. A Tree Inventory and Preservation Plan (TIPP), undertaken by a qualified arborist, is required and should be integrated into the EIS. The TIPP should include the following:
  - Tree inventory information for all trees 10cm DBH or greater proposed to be removed/retained including: Tree # corresponding to plan/drawing, species name, DBH, crown diameter, condition (vigour), remarks, recommended action and rationale.
  - Identify shared, public and private trees with crowns that are within 6 m of property lines.
  - Identify opportunities for protection, enhancement and restoration of trees within the Urban Forest.

  - Tree Protection Fencing locations and/or other tree protection methods.
- The TIPP should also note that where preservation is not possible, as agreed to by the City, compensation is required. Note that the City seeks compensation at a 3:1 replacement ratio. Where replacement plantings are not achievable cash in lieu may be accepted at a rate of $500 for each tree damaged or destroyed.

EIS Data Analysis

- The EIS TOR should indicate that where candidate or confirmed SWH exists, staff would like to see it mapped in the EIS.
- The City of Guelph Local Species List should be consulted when doing the impact analysis and the species lists should include a column to indicate any locally significant species.
- Deer movement patterns that occur on the subject lands should be mapped in the EIS.

Hydrogeological Study to support EIS

- It is not clear where or what type of instrumentation will be used to characterize existing conditions and assess the wetland water balance. In terms of data collection, staff would like to see continuous data loggers installed in piezometers. Also, ensure wetland catchments are delineated and depicted to set the context and that the analysis is provided on a monthly as well as annual basis.

General

- It is acknowledge that the EIS will include a more defined concept of the proposed development plan in order to assess potential impacts resulting from grading, roads, stormwater management, etc.
- The impact analysis does not specifically mention impacts and/or mitigation measures to address salt application.
- An Environmental Implementation Report will be required for this development. Environmental Planning staff have found it helpful to document considerations for the EIR in the EIS.

Suggested Motion	**Staff recommends that the Environmental Advisory Committee accept the Terms of Reference for an Environmental Impact Study prepared by Stantec (July 19, 2018) with the following condition:**

THAT a revised EIS TOR is provided which addresses staff comments and at a minimum includes:

- A study area map showing survey locations;
- A Tree Inventory and Preservation Plan;
- Clarification on surveys proposed for assessing significant wildlife habitat;
- Deer movement surveys using wildlife cameras;
- Commitment to utilize continuous data loggers to collect data to support a wetland water balance and a monthly analysis;
- Recommended mitigation measures for salt management; and
- Considerations for a future Environmental Implementation Report.

17 October 2018

Sent via email

Melissa Straus, MSc.
Terrestrial Ecologist
Stantec
1-70 Southgate Drive
Guelph ON
N1G 4P5

Dear Melissa,

RE: 1242, 1250 and 1260 Gordon Street and 9 Valley Road EIS TOR

City of Guelph Environmental Planning and Park Planning staff reviewed the proposed Environmental Impact Study (EIS) Terms of Reference (TOR) prepared by Stantec, dated July 19, 2018. Park Planning staff provided comments to Environmental Planning Staff on September 7, 2018. The Grand River Conservation Authority (GRCA) also provided comments on the EIS TOR on October 17, 2018 via email. All comments received to date are integrated below and appended to this letter.

On September 12, 2018 the EIS TOR was brought forward to the Environmental Advisory Committee (EAC) and the TOR was accepted with conditions.

Subwatershed Context:

1. The EIS TOR should indicate that the lands fall partially within the Hanlon Creek Subwatershed and partially within the Torrance Creek Subwatershed. As part of the background review, the Torrance Creek Subwatershed Study and Hanlon Creek Subwatershed Study should be referred to. These subwatershed studies include targets and recommendations that should also be considered in the EIS.
2. The hydrology of the adjacent Provincially Significant Wetland (PSW) should be characterized and an associated water balance for the natural feature should be prepared as part of a Hydrogeological Report to support the EIS, in addition to the water budget that forms part of the Stormwater Management Report. This should include consideration for any groundwater impacts from underground parking, where proposed. Incorporation of Low Impact Development (LID) as part of the stormwater management (SWM) approach is also encouraged to assist with achieving a water balance for the site, and maintaining infiltration and recharge functions.

Hydrological / Hydrogeological Study to support EIS

3. It is not clear where or what type of instrumentation will be used to characterize existing conditions and assess the wetland water balance. In terms of data collection, staff would like to see continuous data loggers installed in piezometers. Also, ensure wetland catchments are delineated and depicted to set the context and that the analysis is provided on a

monthly as well as annual basis. Please interpret the data in terms of the pre-to-post wetland water balance.

4. The Hydrogeological Study should identify groundwater levels to inform the required separation distance for the development from the groundwater table.
5. Consideration should also be given to the protection of groundwater functions, including recharge. Also review and consider any other recommendations or requirements from the Torrance Creek Subwatershed Study within the EIS.
6. Results from the Hydrological Study should be integrated into the EIS to assess the potential for hydrologic impacts to the adjacent wetland.

Preliminary Screening Assessment for Significant Wildlife Habitat:

7. April 2017 guidance from the Ministry of Natural Resources and Forestry (MNRF) Guelph District on survey protocols for identifying suitable maternity roost trees indicate that surveys should be completed during leaf-on condition for Tri-colored Bat (*Perimyotis subflavus*) which roost in dead/dying leaves along a dead branch, and during leaf-off condition for Little Brown Myotis/Northern Myotis (*Myotis lucifugus*/*M. septentrionalis*) which roost in tree hollows and cracks. Field surveys are proposed in May to assess Bat Roost Habitat, and should also be proposed during leaf-off condition. Note that surveys in May should be completed in late May to ensure that leaves have in fact developed.
8. Note that where surveys for SWH are not proposed, staff expect a conservative approach to be taken in the EIS which acknowledges candidate SWH and identifies constraints based on the precautionary principle.
9. The EIS TOR indicates that candidate SWH is present for Reptile Hibernaculum. Clarification is needed as to what field surveys for wildlife habitat assessment entail. It is unclear whether or not snake exit surveys and/or snake surveys are proposed.
10. Candidate SWH is also identified for Woodland Raptor Nesting Habitat. Clarification is needed as to whether or woodland raptor nesting surveys are proposed as part of surveys for wildlife habitat.
11. Note that deer movement occurs along the edge of the PSW (as observed through other EISs) as well as across Gordon Street (as indicated in the Natural Heritage Strategy). Table 1 should be updated to reflect this information.

EIS Field Surveys:

12. Location of field surveys, such as breeding bird point count locations and amphibian monitoring stations should be provided on a study area map.
13. MNRF has identified the Torrance Creek PSW as a deer winter congregation area. The habitat should be characterized and impacts assessed through the EIS. In addition, staff request that movement of deer be studied on the subject lands using wildlife cameras to assess movement in the east-west and north-south direction.
14. Clarification on the timing (e.g. spring emergence, first/second breeding bird window), conditions and search effort proposed for wildlife surveys, species of special concern and rare species searches is necessary.
15. Vegetation community mapping should also indicate woodland staking with City staff as a requirement.

16. Spring botanical inventories should ideally be completed in early May. Waiting until June will miss early spring ephemerals, which will have senesced by June.
17. Vegetation community descriptions should include description of soils, per the Ecological Land Classification (ELC) protocol.
18. Table 1 indicates that incidental observations of terrestrial crayfish will be recorded. Clarify where searches for terrestrial crayfish will be performed (i.e. target habitats).
19. Regarding Species of Conservation Concern/Locally Rare Species, it should be noted that City records show that American Bullfrog (*Lithobates catesbeianus*) and Meadow Horsetail (*Equisetum pretense*) have been recently documented in the Torrance Creek Subwatershed.
20. Section 4.2.1.2 Vascular Plants should be revised to indicate that a three-season botanical inventory will be completed.
21. Note that formal wetland boundary and woodland boundary delineation with agencies is required.
22. With respect to area sensitive breeding bird habitat, based on results from multiple EISs completed in this area of the City, it has been confirmed that the Torrance Creek PSW is SWH for area-sensitive breeding bird habitat. The proposed studies should assess the use of habitat edges and areas in relation to the site in order to assess potential impacts.

Tree Inventory and Preservation Plan:

23. The subject lands are regulated under the City’s Private Tree By-law and any tree removals will require authorization from the City. The EIS should inform the development application and should look for opportunities to retain trees and integrate them into the development proposal, where feasible. A Tree Inventory and Preservation Plan (TIPP), undertaken by a qualified arborist, is required and should be integrated into the EIS. The TIPP should include the following:
    - Tree inventory information for all trees 10cm Diameter at Breast Height (DBH) or greater proposed to be removed/retained including: Tree # corresponding to plan/drawing, species name, DBH, crown diameter, condition (vigour), remarks, recommended action and rationale.
    - Identify shared, public and private trees with crowns that are within 6m of property lines.
    - Identify opportunities for protection, enhancement and restoration of trees within the Urban Forest.
    - Tree Protection Fencing locations and/or other tree protection/mitigation measures.
24. The TIPP should also note that where preservation is not possible, as agreed to by the City, compensation is required. Note that the City seeks compensation at a 3:1 replacement ratio. Where replacement plantings are not achievable cash-in-lieu may be accepted at a rate of $500 for each damaged or destroyed tree.

EIS Data Analysis

25. The EIS TOR should indicate that where candidate or confirmed SWH exists, staff would like to see it mapped in the EIS.

26. The City of Guelph Local Species List should be consulted when doing the impact analysis and the species lists should include a column to indicate any locally significant species.
27. Deer movement patterns that occur on the subject lands should be mapped in the EIS, and all data collected from wildlife cameras and field studies should be provided.

Impact Analysis:

28. A buffer analysis should be included within the impacts assessment/avoidance discussion. While the City's OP does include policies for minimum buffers, the establishment of larger buffers warrants consideration in the EIS and is also reflected in the City's OP policies.
29. The proposed development concept needs to consider the trail connection across the site. The EIS should explore alternatives for a trail alignment and assess impacts associated with each alignment. Staff should be consulted for further direction on this item.
30. The setbacks and buffers assigned to the development should factor in the community trail that will be built, even though the trail will ultimately be completed by the City.
31. Opportunities for protection, enhancement and restoration of trees within the Urban Forest should also be identified.
32. The impact analysis should mention potential impacts and/or mitigation measures to address salt application.
33. It is acknowledged that the EIS will include a more defined concept of the proposed development plan in order to assess potential impacts resulting from grading, roads, SWM, etc.

Recommended Mitigation Measures:

34. The EIS should also recommend mitigation measures including environmental education and outreach opportunities, demarcation and any recommendations for monitoring plans.
35. The monitoring plan should include post-construction monitoring of SWM design, LID measures and mitigation.
36. An Environmental Implementation Report (EIR) will be required for this development. Environmental Planning staff have found it helpful to document considerations for the EIR in the EIS.

Park Planning Comments (see attached Memo):

37. Provide a revised development concept plan indicating all the proposed elements including public park, east-west and north-south public trail, Active Transportation Network (ATN) and open space in consultation with City staff.
38. Park planning staff would like to walk the site along with the environmental consultant and environmental planning staff to identify and approve a preliminary trail alignment. The approved trail alignment will be flagged on site. Identify the final trail alignment west of Torrance Creek PSW, through EIS and flag the trail route on site for City's review.
39. Trail design including surfacing, clear width and height, grading and drainage, trail signage, etc. should be provided in consultation with Park Planning staff. The design and development of the trail system should be completed in accordance with the city's Facility Accessibility Design

Manual, the city's current trail design and development practice and standards, and ATN standards.

40. Assess the environmental impact of the proposed trail development in the EIS.
41. Recommend measures to mitigate the environmental impact due to the proposed trail development in the EIS.
42. Recommend management of the woodland along the trail route including removal of invasive species and hazard trees in the EIS.
43. Recommend preparation of an EIR, Trail and Landscape Drawings through EIS to detail design an appropriate trail system and associated mitigation measures in accordance with the city's design and development standards.
44. Provide preliminary grading and drainage plans to demonstrate that the design of the park block, trail connection and open space meets city standards.
45. The owner will be responsible for implementation of city approved landscape plans in accordance with the EIR including, but not limited to restoration, compensation and enhancement planting within the open space.
46. Describe the recommended approach to demarcate existing and proposed public park and open spaces, if any, within and adjacent to the subject property.
47. Recommend provision of public education through educational/interpretive signage at the entry points to the trail and open space system. Public education should address the environmental sensitivity of natural heritage features and procedures residents can follow to protect and/or enhance these areas.
48. City will review and approve the design and locations of interpretive and educational signage, to be included on landscape plans.

Environmental Advisory Committee:
On September 12, 2018 the EIS TOR was brought forward to EAC and resulted in the following draft motion. Note that motions remain draft until such time that EAC formally adopts the minutes.

Staff recommends that the Environmental Advisory Committee accept the Terms of Reference for an Environmental Impact Study prepared by Stantec (July 19, 2018) with the following condition:
THAT a revised EIS TOR is provided which addresses staff comments and at a minimum includes:

- A study area map showing survey locations;
- A Tree Inventory and Preservation Plan;
- Clarification on surveys proposed for assessing significant wildlife habitat;
- Deer movement surveys using wildlife cameras;
- Commitment to utilize continuous data loggers to collect data to support a wetland water balance and a monthly analysis;
- Recommended mitigation measures for salt management; and
- Considerations for a future Environmental Implementation Report.
- A hydrogeological report that includes the following:
    - Infiltration testing using a Guelph Permeameter (or equivalent method) to support SWM planning;

- Hydrographs that include high water table data including the spring freshet and other storm and melt events. Groundwater data should be collected for a minimum of 1 year, with comparison to local precipitation data;
- It is also recommended that groundwater data be collected from the wetland area (pending access).

Do not hesitate to contact me further should you have any questions.

Regards,

Leah Lefler

Leah Lefler, MES
Environmental Planner

Planning, Urban Design and Building Services
Infrastructure, Development and Enterprise
City of Guelph: 1 Carden Street, Guelph

T 519-822-1260 x2362
F 519-822-4632
E leah.lefler@guelph.ca

cc Chris DeVriendt – Manager, Development Planning
Melissa Aldundate – Manager, Planning Policy and Urban Design
Mary Angelo – Supervisor, Development Engineering
Jyoti Pathak – Park Planner

INTERNAL MEMO

DATE September 7, 2018

TO **Leah Lefler**

FROM Jyoti Pathak
DIVISION Parks and Recreation
DEPARTMENT Public Services

SUBJECT **1242, 1250 and 1260 Gordon Street and 9 Valley Road – Proposed Terms of Reference for Environmental Impact Study –(File # TBD)**

Parks Planning and Development has reviewed the draft Terms of Reference (TOR) prepared by Stantec dated July 19, 2018 for an Environmental Impact Study (EIS) to be compiled in support of a draft plan of subdivision and Zoning By-Law and Official Plan Amendments for the proposed high density residential subdivision development on the subject property.

Location: The subject property is located on the east side of Gordon Street immediately south of Valley Road.

Development Proposal: The future development proposal will include a public street, public park, public trail/ ATN route, natural open space, residential apartments and townhouses. A pre-consultation meeting between the applicant and City staff was scheduled on Wednesday June 13, 2018 and a concept plan has been developed by the applicant. The site area is 3.67 hectares inclusive of natural heritage features and a developable area.

Background:

Parkland Dedication:

In accordance with the City's Official Plan Policy 7.3.5.1 (ii) parkland dedication is required for the proposed residential subdivision development. Park block frontage, size and configuration of the park will be determined in accordance with the neighbourhood park design criteria outlined in City's official Plan and Zoning By-Law. Park block would be located within developable area of the site and outside of the existing natural heritage system.

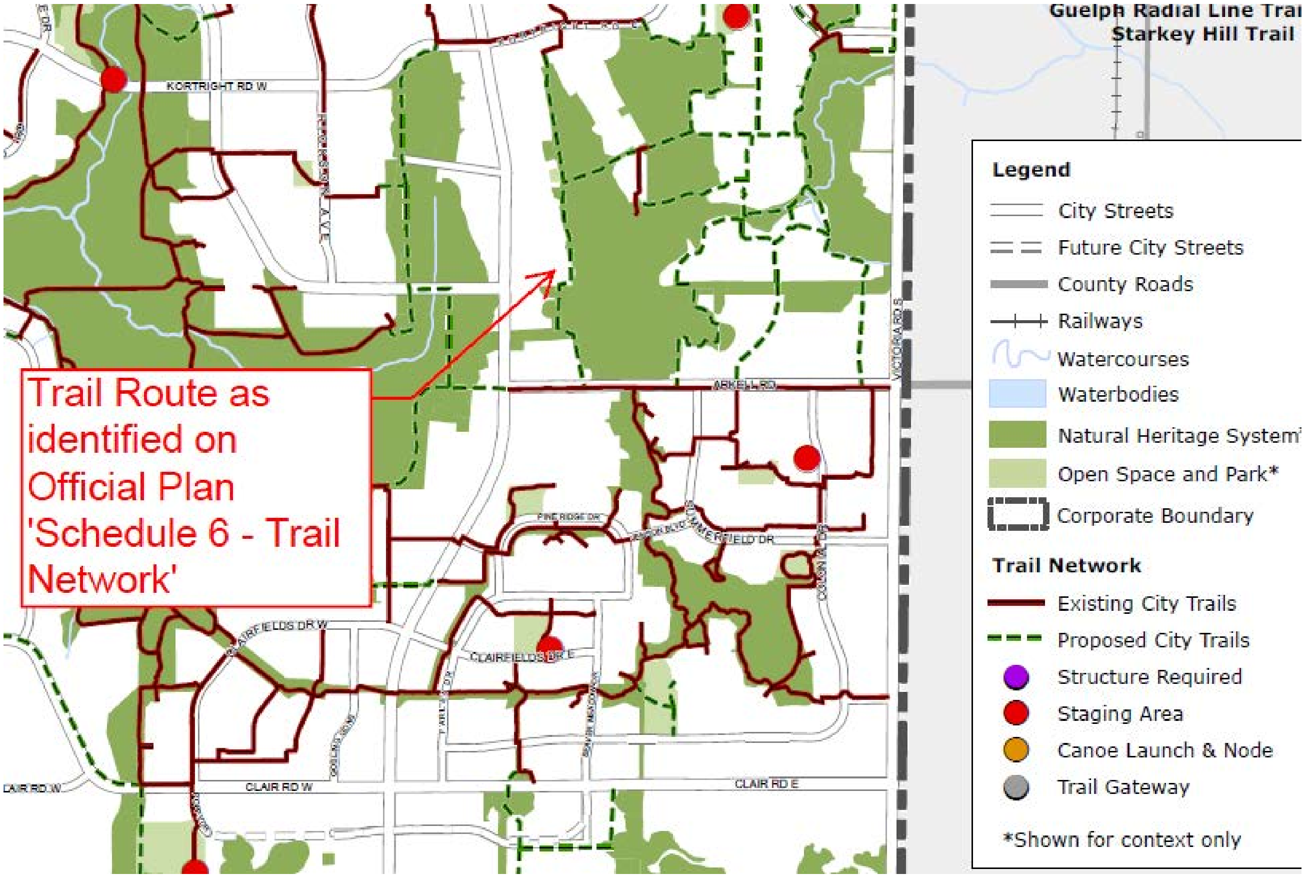
Guelph Trail Network:

Official Plan 'Schedule 6 - Trail Network' identifies a proposed north-south multi-use trail route from Brady Lane (south of Kortright Road East) to Arkell Road along the west side of Torrance Creek PSW Complex. The proposed multi-use trail would be used for walking, cycling, personal mobility devices etc.

Multi-Use Trail System / Active Transportation Route (AT Route) (north-south) from Arkell Road to Brady Lane west of the Torrance Creek provincially significant wetlands (PSW):

The trail system from Arkell Road to Brady Lane aligns with the active transportation route and serves both recreational and transportation purposes. This route is being detailed designed in segments through review of the past and current development applications. The trail route immediately north of the subject property was identified through site plan approval process of the existing Valley Road extension condominium and the trail property immediately south of the subject property has been secured through development approval process on 1280 and 1284 Gordon Street.

Multi-Use Trail / AT Route (east-west) from Gordon Street to the proposed Trail west of Torrance Creek PSW: Provide a direct, accessible, multi-use active transportation route from the Gordon Street to the proposed Multi Use Trail system.



Active Transportation Route in yellow highlight

Parks Planning and Development offer the following comments:

1. **Development concept plan:**
   - Provide a revised development concept plan indicating all the proposed elements including public park, east-west and north-south public trail/ ATN route from Gordon Street to the and open space in consultation with City staff.

2. **Trail route alignment:**
   - Park planning staff would like to walk the site along with the environmental consultant and environmental planning staff to identify and approve preliminary trail alignment. The approved trail alignment will be flagged on site. Identify the final trail alignment west of Torrance Creek PSW, through EIS and flag the trail route on site for City's review.

3. **Trail design and development standards:**
   - Trail design including surfacing, clear width and height, grading and drainage, trail signage etc. would be finalized in consultation with Park Planning staff. The design and development of the trail system would be completed in accordance with City's Facility Accessibility Design Manual, City's current trail design and development practice and standards and Active Transpiration standards.

4. **Environmental impacts and mitigation:**
    - Assess the environmental impact of the proposed trail development through EIS.
    - Recommend measures to mitigate the environmental impact due to the proposed trail development through the EIS.
    - Recommend management of the woodlot along the trail route including removal of invasive species and hazard trees through the EIS.
    - Recommend preparation of an Environmental Implementation Report (EIR), Trail and Landscape Drawings through EIS to detail design an appropriate trail system and associated mitigation measures in accordance with the City's design and development standards.
5. **Grading and drainage:**
    - Provide preliminary grading and drainage plans to demonstrate that the design of the park block, trail connection and open space meets City's standards.
6. **Open space restoration and enhancement:**
    - The owner will be responsible for implementation of City approved landscape plans in accordance with the EIR including, but not limited to, restoration, compensation and enhancement planting within the open space.
7. **Demarcation of public open space:**
    - Describe the recommended approach to demarcate existing and proposed public park and open spaces, if any, within and adjacent to the subject property.
8. **Public education:**
    - Recommend provision of public education through educational/ interpretive signage at the entry points to the trail and open space system. Public education should address the environmental sensitivity of natural Heritage features and procedures residents can follow to protect and/or enhance these areas.
    - City will review and approve the design and locations of interpretive and educational signage, to be included on landscape plans.

Summary:
Revise the Terms of Reference for scoped EIS, to address Parks comments above, for our further review.

Please contact me if you have any questions.

Sincerely,

Jyoti Pathak,
Parks Planner

Parks and Recreation
Public Services
Location: City Hall
T 519-822-1260 x 2431
E Jyoti.pathak@guelph.ca

Leah Lefler

From: Fred Natolochny <fnatolochny@grandriver.ca>
Sent: Wednesday, October 17, 2018 10:11 AM
To: Leah Lefler
Subject: FW: 1242, 1250, 1260 Gordon St. 9 Valley Rd. Guelph

From our ecologist. Can you also send me the original message again – I appear to have mis-filed it. Sorry

---

From: Robert Messier
Sent: October 16, 2018 9:06 AM
To: Fred Natolochny
Subject: 1242, 1250, 1260 Gordon St. 9 Valley Rd. Guelph

I have reviewed the ToR EIS for the redevelopment of 1242, 1250, 1260 Gordon St. and 9 Valley Rd. in Guelph. As part of the background review they should also look at the Torrence Creek Subwatershed study and the Hanlon Creek subwatershed study. For the monitoring plan they should include a post construction monitoring of SWM design and mitigation. The setbacks and buffers assigned to the development should factor in the community trail that will be built even though the trail will ultimately be completed by the City. If you have any questions please let me know

Robert Messier
Ecologist
Grand River Conservation Authority
400 Clyde Road
Cambridge, Ontario N1R 5W6
(519) 621-2763 x2310
www.grandriver.ca

From: Leah.Lefler@guelph.ca
To: Straus, Melissa
Subject: RE: 1242, 1250 and 1260 Gordon St, 9 Valley Rd EIS TOR - Proposed Deer Survey
Date: Friday, October 19, 2018 8:49:23 AM

Ok great. That what I figured, but wanted to be certain.

It will be interesting to see what you find from that monitoring work. Keep me posted!

Have a great weekend,
Leah

Leah Lefler | Environmental Planner
Planning, Urban Design and Building Services | **Infrastructure, Development and Enterprise**
City of Guelph
T 519-822-1260 x 2362 | F 519-837-5640
leah.lefler@guelph.ca

From: Straus, Melissa [mailto:Melissa.Straus@stantec.com]
Sent: Thursday, October 18, 2018 4:50 PM
To: Leah Lefler <Leah.Lefler@guelph.ca>
Subject: RE: 1242, 1250 and 1260 Gordon St, 9 Valley Rd EIS TOR - Proposed Deer Survey

Thanks Leah,

Yes, I meant so we could see around all the vegetation on the site.

Thanks for your prompt reply.

Melissa Straus M.Sc.
Terrestrial Ecologist

Direct: 519 780-8103
Mobile: 226 971-2704
Fax: 519 836-2493
Melissa.Straus@stantec.com

Stantec
1-70 Southgate Drive
Guelph ON N1G 4P5 CA

From: Leah.Lefler@guelph.ca <Leah.Lefler@guelph.ca>
Sent: Thursday, October 18, 2018 4:20 PM
To: Straus, Melissa <Melissa.Straus@stantec.com>
Subject: RE: 1242, 1250 and 1260 Gordon St, 9 Valley Rd EIS TOR - Proposed Deer Survey

Hi Melissa,

The approach provided makes sense to me, and is consistent with the notes I took at the EAC meeting. One question of clarification, by 'camera visibility' do you mean camera placement based on inconspicuous location (to abate theft) or the camera's field of view/lack of visual obstruction? If you mean the latter, than I am supportive of the proposed camera locations.

Thanks,
Leah

Leah Lefler | Environmental Planner
Planning, Urban Design and Building Services | **Infrastructure, Development and Enterprise**
City of Guelph
T 519-822-1260 x 2362 | F 519-837-5640
leah.lefler@guelph.ca

From: Straus, Melissa [mailto:Melissa.Straus@stantec.com]
Sent: Thursday, October 18, 2018 4:07 PM
To: Leah Lefler <Leah.Lefler@guelph.ca>
Cc: Melissa Aldunate <Melissa.Aldunate@guelph.ca>; Chris DeVriendt <Chris.DeVriendt@guelph.ca>; Mary Angelo <Mary.Angelo@guelph.ca>; Jyoti Pathak <Jyoti.Pathak@guelph.ca>; Hendriksen, Chris <Chris.Hendriksen@stantec.com>; Eusebi, Daniel <dan.eusebi@stantec.com>
Subject: 1242, 1250 and 1260 Gordon St, 9 Valley Rd EIS TOR - Proposed Deer Survey

Hi Leah,

Thank you very much for sending along these comments.

We are still working on updating the ToR with these new comments, but in the interest of time as we are looking to start our deer movement surveys in the next few weeks so I'd like to send you that in advance of the ToR resubmission for your review.

Please find attached our field survey mapping, which includes the proposed trail camera locations. Below is the proposed methods for the trail camera monitoring. Please advise.

1.1.1 Deer Movement Study

Five wildlife cameras will be used to obtain information deer movement activity on the Subject Property. Cameras will be installed in early November, deployed until the end of January. This timing is proposed to capture movement into the known overwintering area associated with the PSW and is consistent with deer movement studies undertaken along this corridor to the east for 220 Arkell Road. Camera deployment locations are shown on **Figure 3** and were chosen to address camera visibility, north-south and east-west movement opportunities, and feedback from EAC on September 12, 2018.

Thank you,

Melissa Straus M.Sc.
Terrestrial Ecologist

Direct: 519 780-8103

Mobile: 226 971-2704
Fax: 519 836-2493
Melissa.Straus@stantec.com

Stantec
1-70 Southgate Drive
Guelph ON N1G 4P5 CA

From: Leah.Lefler@guelph.ca <Leah.Lefler@guelph.ca>
Sent: Wednesday, October 17, 2018 12:50 PM
To: Straus, Melissa <Melissa.Straus@stantec.com>; Whitehead, Grant <grant.whitehead@stantec.com>
Cc: Melissa.Aldunate@guelph.ca; Chris.DeVriendt@guelph.ca; Mary.Angelo@guelph.ca; Jyoti.Pathak@guelph.ca; fnatolochny@grandriver.ca
Subject: 1242, 1250 and 1260 Gordon St, 9 Valley Rd EIS TOR

Hi Melissa,

See City and GRCA comments attached.

If you have any questions, please let me know.

Regards,
Leah

Leah Lefler | Environmental Planner
Planning, Urban Design and Building Services | **Infrastructure, Development and Enterprise**
City of Guelph
T 519-822-1260 x 2362 | F 519-837-5640
leah.lefler@guelph.ca

guelph.ca
facebook.com/cityofguelph
@cityofguelph

This e-mail message (including attachments, if any) is intended for the use of the individual to whom it is addressed and may contain information that is privileged and confidential. If you are not the intended recipient, you are notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify the sender and erase this e-mail message immediately.

APPENDIX D
GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION

TWO 12-STOREY APARTMENT BUILDINGS
1242, 1250, 1260 GORDON STREET
GUELPH, ONTARIO

CMT Project 18-099.R01

Prepared For:

XCG Consulting Limited

April 25, 2018

CMT ENGINEERING INC.

CMT Engineering Inc.

CONSULTING ENGINEERS

1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel: ***519-699-5775***
Fax: ***519-699-4664***
www.cmtinc.net

April 25, 2018 18-099.R01

XCG Consulting Limited
820 Trillium Drive
Kitchener, Ontario
N2R 1K4

Attention: Mr. Kristian Peter, B.Sc. (Eng.), P.Eng., QP$_{\text{ESA}}$

Dear Kristian,

Re: Geotechnical Investigation
Two 12-Storey Apartment Buildings
1242, 1250, 1260 Gordon Street
Guelph, Ontario

As requested, CMT Engineering Inc. conducted a geotechnical investigation at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements and we thank you for allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours very truly,

Shawn Wheatley, B.Sc

TABLE OF CONTENTS

1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Mr. Kristian Peter, P.Eng. of XCG Consulting Limited (XCG) to conduct a geotechnical investigation for the proposed residential development at 1242, 1250, and 1260 Gordon Street, Guelph, Ontario. The location of site is shown on Drawing 1.

It is understood that the project will comprise the construction of construction of two 12-storey apartment buildings; one with two levels of underground parking and one with one level of underground parking.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); recommended founding elevations; site classification for seismic site response; dewatering considerations; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; and a summary of the laboratory test results.

2.0 EXISTING SITE CONDITIONS

The site currently comprises three (3) houses with various treed areas. The site slopes down slightly towards Gordon Street to the southwest. The site is bounded by Gordon Street to the southwest, residential properties to the northwest and southeast, and vacant treed land to the northeast. The location of the site is shown on Drawing 1.

3.0 FIELD AND LABORATORY PROCEDURES

Prior to the commencement of the field drilling program, locates were organized by CMT Inc. to ensure that underground utilities would not be damaged.

The drilling field investigation was conducted on April 17, 18, and 19, 2018 and comprised the advancement of ten (10) boreholes (referenced as Borehole 1 to Borehole 10), utilizing a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc. The boreholes were advanced to depths ranging from 7.62 m (25.0 ft) to 9.75 m (32.0 ft) below the existing ground surface elevations.

Boreholes 1 to 6 were advanced in the area of the proposed apartment building with two storeys of underground parking. Boreholes 7 to 10 were advanced in the area of the proposed apartment building with one storey of underground parking.

Soil sampling was undertaken utilizing the Standard Penetration Test (SPT), as well as Macro Core (MC5) systems for Boreholes 1 to 10. Standard Penetration Testing (SPT) was generally conducted at 0.76 m (2.5 ft) intervals to a depth of 3.66 m (12.0 ft), after which SPT sampling was conducted at 1.5 m (5.0 ft) intervals to borehole termination. MC5 continuous sampling was conducted between the 1.5 m (5.0 ft) SPT sampling intervals. Technical staff from CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each sample was placed in a sealed, marked jar for moisture content determinations.

Representative samples from the following boreholes and depths were submitted to our laboratory for grain size analyses:

- Borehole 2 – depth 7.62 m to 9.14 m
- Borehole 5 – depth 1.52 m to 2.13 m
- Borehole 8 – depth 1.52 m to 2.13 m

The borehole logs are provided in Appendix A, and the grain size analyses are provided in Appendix B.

The geotechnical investigation was completed in conjunction with an environmental assessment by XCG Consulting Limited. The environmental investigation involved the analyzing of soils sampled from Borehole 3.

CMT Inc. surveyed the ground surface elevations at the borehole locations on April 5, 2018. The top of the manhole cover on Gordon Street across from house number 1260 was utilized as a temporary benchmark with a reported elevation of 336.21 m. The ground surface elevations at the borehole locations ranged from 338.04 m to 342.45 m. The locations of the boreholes and the temporary benchmark are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes are described briefly below and a more detailed stratigraphic description is provided on the borehole logs in Appendix A.

4.1. Topsoil

Dark brown, very loose to loose, silty, organic topsoil was encountered at the surface of all boreholes, with the exception of Borehole 8 which was located within an exposed driveway and hence had no topsoil cover. Where present, the topsoil ranged in thickness from approximately 190 mm to 250 mm (average 225 mm). The topsoil was considered moist to wet.

4.2. ***Sand and Silt***

Dark to light brown sand and silt, with some gravel and trace clay was encountered underlying the topsoil in Boreholes 1 to 7, 9 and 10, at the surface of Borehole 8, and underlying the sand in Boreholes 6 and 7. The sand and silt was considered very loose to dense, with SPT N-values ranging from of 1 to 82 blows per 0.30 m. The sand and silt was considered moist to wet, with moisture contents ranging from 7.5% to 22.4% (average 11.7%). The sand and silt was typically dark brown, loose to very loose and wet in the upper portions directly underlying topsoil, with trace organic content as well as rootlets.

4.3. ***Sand***

Brown sand, with up to trace amounts of silt and gravel, was encountered underlying the sand and silt in Boreholes 6, 7, and 9. The sand was considered compact to dense, with SPT N-values ranging from 10 to 45 blows per 0.30 m (average 27 blows per 0.30 m). The sand was considered moist to wet, with moisture contents ranging from 6.0% to 18.4% (average 12.8%).

4.4. ***Silt and Sand Till***

Light brown to grey, silt and sand till, with some gravel and trace clay, was encountered underlying the sand and silt in Boreholes 1 to 8, and Borehole 10, and underlying the sand in Borehole 9. The silt and sand till was considered very dense, with SPT N-values ranging from 57 to over 100 blows per 0.30 m (average 94 blows per 0.30 m). The silt and sand till was considered moist, with moisture contents ranging from 5.0% to 10.4% (average 7.0%).

4.5. ***Groundwater***

Accumulated groundwater was observed in Borehole 9, at an elevation of 335.98 m, corresponding to a depth of 3.17 m below ground surface. Accumulated groundwater was not observed in any of the other boreholes conducted as part of this investigation, though some wet soil conditions were observed within the upper sand and silt, as well as the sand soils. The very dense, relatively fine-grained silt and sand till has the potential to create perched water conditions in the overlying soils. It should be noted that groundwater conditions (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume.

Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

5.0 DISCUSSION AND RECOMMENDATIONS

It is understood that the project will comprise the construction of construction of two 12-storey apartment buildings; one with two levels of underground parking and one with one level of underground parking.

Utilizing the information gathered during the geotechnical investigation and assuming that the borehole information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided.

5.1. Serviceability and Ultimate Limit Pressure

The following table provides the estimated highest founding elevation on the existing soils

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Soil Type
1	340.87	500 (10,000)	750 (15,000)	338.53 to 331.12 (termination)	Sand and Silt/ Silt and Sand Till
2	341.25	150 (3,000)	225 (4,500)	340.49 to 337.85	Sand and silt
		500 (10,000)	750 (15,000)	337.85 to 332.11 (termination)	Silt and Sand Till
3	340.76	150 (3,000)	225 (4,500)	338.17 to 337.71	Sand and Silt
		500 (10,000)	750 (15,000)	337.71 to 331.62 (termination)	Sand and Silt/ Silt and Sand Till
4	342.45	150 (3,000)	225 (4,500)	340.93 to 340.14	Sand and Silt
		500 (10,000)	750 (15,000)	340.14 to 333.31 (termination)	Silt and Sand Till
5	341.62	150 (3,000)	225 (4,500)	340.86 to 338.11	Sand and Silt
		500 (10,000)	750 (15,000)	338.11 to 332.48 (termination)	Silt and Sand Till
6	340.48	150 (3,000)	225 (4,500)	339.72 to 335.60	Sand and Silt/Sand
		500 (10,000)	750 (15,000)	335.60 to 331.34 (termination)	Silt and Sand Till
7	339.88	150 (3,000)	225 (4,500)	339.12 to 335.31	Sand and Silt/Sand
		500 (10,000)	750 (15,000)	335.31 to 332.26 (termination)	Silt and Sand Till
8	338.04	150 (3,000)	225 (4,500)	337.28 to 335.75	Sand and Silt
		500 (10,000)	750 (15,000)	335.75 to 330.42 (termination)	Silt and Sand Till
9	339.15	150 (3,000)	225 (4,500)	337.63 to 334.58	Sand
		500 (10,000)	750 (15,000)	334.58 to 330.92 (termination)	Silt and Sand Till
10	338.50	150 (3,000)	225 (4,500)	337.74 to 336.04	Sand and Silt
		500 (10,000)	750 (15,000)	336.04 to 330.88 (termination)	Silt and Sand Till

Based on the bearing capacities and elevations provided in the table above, suitable founding elevations for conventional foundations designed with a minimum bearing capacity of 500 kPa (10,000 psf) at SLS and 750 kPa (15,000 psf) at ULS range below elevations 334.58 m to 340.14 m for Boreholes 1 to 10. It should be noted that the above-referenced elevations of soils capable of supporting foundations designed with a bearing capacity of 500 kPa (10,000 psf) at SLS and 750 kPa (15,000 psf) at ULS corresponds with depths ranging from approximately 2.29 m to 4.88 m below the existing ground surface at the borehole locations.

Soil capable of supporting foundations are generally encountered below the topsoil and upper zone of soft, native soils containing organics and rootlets at the borehole locations, Therefore, the topsoil and relatively soft native soils must be subexcavated in the areas of the proposed structures. The founding soil must be assessed at the time of construction by qualified geotechnical personnel in order to confirm their founding suitability.

Should footings be designed to be constructed at elevations higher than the elevations indicated in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. The serviceability limit pressure for granular structural fill placed and compacted in accordance with Section 5.4.5 of this report and constructed on approved competent native soils is estimated to be at least 150 kPa (3,000 psf). Alternatively, footings could be stepped down to bear on approved undisturbed founding soils.

Footings may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings is separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings. This must be taken into account for any deep structures such as elevator pits, sump pits and/or pump chambers.

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation (sufficient thermal insulation is required to protect all footings and slab-on-grades during construction until such a time that the structure is heated) in order to provide protection from frost action.

At the time of investigation, the proposed founding elevations were not available. CMT Inc. would be pleased to review design drawings when they become available and provide further recommendations with respect to bearing and foundation elevations.

5.2. ***Seismic Site Classification***

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 9.75 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class C (stiff soils) for structures founded on the native soils at the recommended founding elevations provided in Section 5.1 of this report. For foundations constructed on structural fill, placed in accordance with Section 5.5 of this report, the site classification for seismic site response would be considered Site Class D (stiff soil). The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. ***Soil Design Parameters***

The following soil design parameters can be utilized for shoring and/or foundation design calculations:

Soil Type	**Soil Density (kg/m^3)**	**Friction Angle (Degree)**	**Coefficient of Active Pressure (K_a)**	**Coefficient of Passive Pressure (K_p)**	**Coefficient of At-Rest Pressure (K_o)**	**Coefficient of Friction (μ)**
Imported Gran 'A'/Gran 'B' (OPSS 1010)	2,100	34 °	0.28	3.54	0.44	0.45
Sand and Silt	1,800	32°	0.31	3.25	0.47	0.41
Sand	1,850	32°	0.29	3.46	0.45	0.37
Silt and Sand Till	1,900	34°	0.28	3.54	0.44	0.45

5.4. ***Site Preparation***

The site preparation for the proposed new residential development will include the demolition of the existing residential dwellings on the property, topsoil stripping, vegetation grubbing, the removal or relocation of any existing services, the subexcavation of all unsuitable native soils deemed not capable of supporting the design bearing capacity, followed by the placement of structural fill (as required) and site grading to achieve proposed grades.

5.4.1. ***Building Demolition***

Currently, three (3) residential dwellings exist on the property, which are to be removed. All above-grade structures as well as all foundations, concrete slabs, and loose backfill must be removed within the proposed building envelopes, driveways, and surface parking lot areas.

All excavations must be inspected and then backfilled as required according to the procedures outlined in Section 5.4.5 of this report. It is recommended that good quality imported sand and gravel (OPSS 1010 Type II or Type III Granular 'B' or an approved alternative) be placed as structural fill as required. Provided any concrete from former building foundations and slab-on-grades, as well as any other concrete on-site (if encountered) is reduced to a maximum size of 100 mm, and all reinforcing steel and any deleterious materials are removed, the reduced concrete material may be combined with imported granular fill to be utilized as fill on-site. The reuse of this material will be subject to approval from qualified geotechnical personnel.

5.4.2. ***Topsoil Stripping/Vegetation Removal***

All topsoil, vegetation, and trees (including tree root structures as well as any loose soils that are typically associated with root structures) must be removed from within the proposed building, parking lot, and driveway envelopes to expose approved competent subgrade soils. The topsoil may be used in landscaped areas where some settlement can be tolerated; otherwise it should be properly disposed of off-site.

5.4.3. ***Unsuitable Soil Removal***

The upper sand and silt soils underlying the topsoil contain organic material and root structures, and are typically loose to very loose, and as such would be considered unsuitable to support footings, slab-on-grades (including expansive sidewalk areas), driveways and parking lot pavement structure. Therefore, it is recommended that this material be subexcavated from these areas. These materials are considered highly frost-susceptible and present the opportunity for premature damage to the pavement structure due to frost heave during freeze/thaw cycles. Due to the inconsistency in the soil materials, it may be prudent to have qualified geotechnical personnel on-site during the site grading process in order to confirm the suitability of the soils for reuse.

5.4.4. Removal/Relocation of Existing Services

Any existing/abandoned underground services (if present) that may be located within the proposed building envelope and/or parking lot and driveway areas should be removed/relocated. If left in place, the location of existing services must be reviewed to ensure that they do not conflict with the proposed foundation location. All terminated pipes must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids which can result in potential settlement. All existing trench backfill material associated with any underground services must be subexcavated and the subsequent excavation should be backfilled with approved soils placed in accordance with Section 5.4.5 of this report.

Based on the age and location of the existing buildings, it would be expected that the existing houses may have been previously serviced by an on-site sewage system which should include a septic tank and associated distribution piping. The presence and/or location of existing septic systems were not observed/confirmed as part of this geotechnical investigation. It is recommended that the previous owners be consulted if possible to determine if a septic system may exist and if so, where it may be located. There is the potential to follow any sewage pipes that exit the basement to assist in location a septic tank and distribution piping. Any existing septic system components (including septic tank, distribution piping and associated clear stone bedding) must be removed and disposed of properly off-site.

The presence of existing potable water wells was not observed/confirmed during the geotechnical investigation. Water piping that exits the basement could also be followed in order to try and locate any potential potable water wells that may be located on the property. A review of Ministry of the Environment (MOE) well records indicated that a former dug well (0.91 m diameter by 8.23 m deep) was decommissioned at 1250 Gordon Street on October 11, 2005. As such, there is the potential for potable water wells to exist at 1242 and 1260 Gordon Street as well. It is a requirement of the Ontario Water Resources Act, Regulation 903, that ay wells be decommissioned by an MOE licensed well contractor if they are no longer required. A well that has been constructed to provide drinking water (potable water) would require an MOE licensed well contractor with a Class 1 or Class 2 license to decommission the well in accordance with Reg. 903.

All existing backfill and any disturbed soils associated with the removal of any septic system and/or well components must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.5 of this report.

5.4.5. ***Site Grading***

Following the stripping of topsoil and subexcavation of any fill and/or loose to very loose soils deemed unsuitable of supporting foundations, slab-on-grad and/or driveway and parking lot pavement structure, the exposed subgrade must be proof-rolled and any soft or unstable areas must be subexcavated and replaced with approved fill materials. Any fill materials required to achieve the design site grades should be placed according to the following procedures:

- Should the native subgrade soils at the design founding elevation in the proposed building envelope(s) comprise wet or saturated soils, then a granular drainage layer constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) may be required. Alternatively, a lean mix concrete mud mat may be poured overlying the subgrade soils to provide a stable base;

- Prior to placement of any structural fill, the subgrade for the proposed new buildings must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundation down to the competent native founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill materials) and 0.2 m (8") in depth for silts and clays, or the capacity of the compactor (whichever is less);

- Granular fill materials (OPSS 1010 Type II or Type III Granular 'B' recommended for this application) can be compacted utilizing adequate heavy vibratory smooth drum compaction equipment;

- Fine-grained silt and clay soils (if imported) must be compacted utilizing adequate heavy padfoot vibratory compaction equipment;

- Approved fill materials must be at suitable moisture contents to achieve the specified compaction;

- Approved structural fill materials that will support structures (including foundations, interior slab-on-grades, sidewalks and large expansive exterior slabs) must be compacted to 100% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for roadway and driveways) must be compacted to a minimum 95% SPMDD;

- Granular 'B' subbase and Granular 'A' base materials for the roadway and driveways must be compacted to 100% SPMDD.

Based on the subsurface conditions observed in the boreholes, wet soils may be encountered, depending on the depth of excavation. As such, for soils excavated from the zone of saturation, significant air-drying along with working of the soils may be required in order to achieve the specified compaction of 100% SPMDD in the building envelope (including 1:1 as required) and 95% SPMDD for bulk fill for the parking lot and driveways. Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. It should be noted, however, that due to the nature of some of the soils, during hot dry weather, the addition of water might be required in order to achieve the specified compaction. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

5.5. __Foundation Subgrade Preparation__

The native sand and silt, sand, as well as the silt and sand till encountered in the boreholes are sensitive to change in moisture content and can become loose/soft if the subjected to additional water or precipitation as well as severe drying conditions. The native subgrade soils could also be easily disturbed if traveled on during construction. Once they become disturbed they are no longer considered adequate for the support of shallow foundations. To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade should be sloped to a sump (as required) located outside the building footprint (if feasible) in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation. It is critical that all water be controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and any potential fill materials must be maintained above freezing;

- Prior to pouring concrete for the footings, the footing area must be cleaned of all disturbed or caved materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection and approval of the founding soils. The longer that the excavated soils remains open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be poured in order to protect the structural integrity of the founding soils.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade should be proof-rolled. Any soft or weak zones should be subexcavated and backfilled with approved fill materials (see Section 5.7 of this report).

The following table provides the modulus of subgrade reaction (k) for the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Sand and Silt	54,000 kN/m^3 (200 lb/in^3)
Sand	68,000 kN/m^3 (250 lb/in^3)
Silt and Sand Till	81,000 kN/m^3 (300 lb/in^3)
Imported Sand and Gravel (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)

In dry conditions, the floor slab can be founded on a minimum thickness of 150 mm (6") of Granular 'A' (OPSS 1010) and compacted to 100% SPMDD. Alternatively (particularly in wet conditions), 150 mm (6") of 19 mm clear crushed stone (OPSS 1004) could be used instead of Granular 'A'. Compactive effort should be utilized to consolidate the clear stone.

It is recommended that areas of extensive exterior slab-on-grade (sidewalks, accessibility ramps and exterior stairs) be constructed with a Granular 'B' subbase (300 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to provide rapid drainage and reduce the effects of frost heaving. This is particularly critical at all barrier-free access points. Alternatively, a structural frost slab or thermal insulation could be designed and constructed at door entrances.

5.7. ***Excavations***

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 2 Soils - In general, the very dense silt and sand till soils encountered in the boreholes, in a drained state (not saturated), would be classified as Type 2 soils under Reg 213/91. Type 2 soils must be sloped from within 1.2 m of the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. Soils underlain by Type 3 or Type 4 soils that are exposed in the excavation must be treated accordingly as Type 3 or Type 4 soils (see below). Soils in a saturated condition (if encountered) must be treated as Type 4 soils, addressed below.

Type 3 Soils - In general, the compact sand and silt, as well as the sand soils encountered in the boreholes, in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, any wet to saturated soils would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

If it is not practical to excavate according to the above requirements, then a trench support system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized.

It should be noted that the native sand and silt, as well as the silt and sand till soils were observed to be very dense in places (N-values in excess of 50 blows). If excavations extend into these soils, it may prove difficult to excavate with conventional excavating equipment, impacting the production schedule. It is imperative that when very dense/hard soils are utilized for backfilling of service trenches, the material must be broken down (pulverized) to minimize voids and reduce the potential for settlement. It is not recommended that the very dense silt and sand till be utilized as structural fill, as it can be subject to excessive void space and potential settlement if not properly placed and compacted.

5.8. ***Construction Dewatering Considerations***

Accumulated groundwater was observed in Borehole 9, at an elevation of 335.98 m, corresponding to a depth of 3.17 m below ground surface. Accumulated groundwater was not observed in any of the other boreholes conducted as part of this investigation, though some wet soil conditions were observed within the upper sand and silt, as well as the sand soils. The very dense, relatively fine-grained silt and sand till has the potential to create perched water conditions in the overlying soils. It should be noted that groundwater conditions (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. As such, provisions for site dewatering should be part of the site development and construction process.

Seepage control requirements during construction will depend upon the area of work on the site, the depth of the excavations, the time of year, the amount of precipitation and the control of surface water. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. However, if heavy seepage occurs, it may be necessary to increase the number of pumps during construction.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

5.9. Service Pipe Bedding

The native soils encountered in the geotechnical investigation are generally considered suitable for indirect support of the site service pipes. Should instability due to saturated soil conditions be encountered, it may be necessary to increase the thickness of the granular base and utilize 19 mm clear stone to create an adequate supporting base for the service pipes and/or manholes. Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSD, OPSS and OBC standards and guidelines and as follows:

Flexible Pipes - The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.031. The trench excavations should be symmetrical with respect to the centreline of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, then the pipe bedding should consist of 19 mm clear stone (meeting OPS Specifications) wrapped completely in a geotextile fabric such as Terrafix 270 or equivalent. The general contractor is responsible to protect service piping from damage by heavy equipment.

Rigid Pipes - In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be $0.15D$ (where D is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining a dry building with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m to 2.0 m (depending on side yard setbacks). Any surface discharge rainwater leaders must be constructed with solid piping that discharges with positive drainage at least 1.5 m away from building foundations and/or beyond sidewalks to a drainage swale or appropriate storm drainage system.

It should be noted that based on the observations in the boreholes, there is potential for perched water conditions. The construction of foundations, slabs-on-grade, elevator pits and sump pits within or below zones of saturation will require design of site-specific waterproofing and dewatering systems constructed in accordance with the 2012 OBC. It is recommended that a good quality sump pump be utilized and that the system be equipped with a battery back-up in the event of power failure, (keeping in mind that a battery back-up system does not typically have a long run time). If required, it would be recommended that a waterproofing supplier/specialist be consulted to recommend an appropriate product and installation requirements that would be suited to this site.

An exterior perimeter weeping tile system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone (OPSS 1004) and wrapped in a geotextile filter fabric such as Terrafix 270R (or equivalent), must be installed at an elevation that is below the proposed slab-on-grade elevation and provided with positive drainage into a sump pit. The portion of the piping that connects the exterior weeping tile system into the sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. It may be prudent to install perforated drainage pipe on the interior as well to provide an outlet for any water that may collect in the subslab stone (particularly during the construction phase of the project). It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). The rainwater leaders must not be connected to the perimeter weeping tile system. Foundation wall and slab-on-grade damp proofing and/or waterproofing must conform to current OBC regulations.

Depending on the groundwater conditions at the design founding elevations, it may be necessary to install a granular drainage layer to provide a suitable base for the foundations. This will depend on the bearing capacity required for the founding strata. If required, the granular drainage layer must conform to the requirements listed in Section 9.14.4 of the OBC 2012.

In order to reduce the effects of surficial frost heave, it is recommended that the exterior foundation backfill in areas that will be hard surfaced consist of free-draining granular material such as imported Granular 'B' Type I or III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation walls and/or beyond perimeter sidewalks and entranceway slabs. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled and the height of the wall is such that lateral support is required, or where the required concrete strength has not been achieved, the wall must be braced or laterally supported prior to backfilling. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 98% SPMDD.

The native mineral soils (non-organic), are generally considered suitable for reuse as trench backfill and bulk fill in the roadway and driveways; however, the wet to saturated soils will require significant air-drying in order to achieve the specified field compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment should be used for the compaction and to break down any large blocky pieces of soil;
- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for clay and silt soils or the capacity of the compactor (whichever is less);
- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas; service trenches excavated within the zone of influence of footings for structures must be compacted to a minimum of 100% SPMDD;
- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;
- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;

- If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

5.11. ***Pavement Design/Drainage***

As previously indicated, any fill and all existing very loose or loose native soils must be subexcavated from within the proposed driveways and surface parking lot areas. Alternatively, prior to placement of the granular base, the loose native soils could be further consolidated. It would be expected that significant air-drying of this material will be required in order to achieve the design compaction. Any soft or unstable areas should be subexcavated and replaced with suitable drier materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward catch basins (if installed) or to the pavement edge (provided proper gravity drainage to a suitable outlet is provided). When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance. The requirement for subdrains will be dependent on the composition of the prepared road subgrade soils. Should the subgrade soils comprise fine-grained, frost-susceptible soils, it is highly recommended to install subdrains (provided gravity drainage to a suitable outlet can be provided). It is recommended to install minimum 100 mm diameter perforated subdrains to collect and redirect water beneath the pavement surface. Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain, then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent) and a factory installed filter sock is not required. Installation of rigid subdrains allows for better grade control and less potential for damage during installation; however, it would be expected that there would be higher cost implications associated with the installation of rigid subdrains over flexible subdrains. Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost action. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that, at a minimum, subdrains be installed through all low areas in the parking lot and driveways, and ideally along the curb lines as well to prevent water from entering the granular subbase. The subdrains should be installed in a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

Should the subgrade soils comprise free-draining granular soils (minimum 1.0 m thick with positive drainage at the interface with any relatively impermeable soils), then the installation of subdrains may not be required.

The native subgrade soils are sensitive to change in moisture content and can become loose or soft if the soils are subject to inclement weather and seepage or severe drying. Furthermore, the subgrade soils could be easily disturbed if traveled on during construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

It is expected that the driveways and parking lots will experience light traffic (personal vehicles) and heavy traffic (moving trucks, delivery trucks, as well as maintenance and emergency vehicles). Based on the anticipated loading, the following pavement design is provided:

Material	**Recommended Thickness For New Pavement**	
	Light Traffic	Heavy Traffic
Asphaltic Concrete	HL3-40 mm (1.5") HL4 or HL8-50 mm (2.0")	HL3-40 mm (1.5") HL4 or HL8-60 mm (2.0")
Granular 'A' Base	150 mm (6.0")	150 mm (6.0")
Granular 'B' Subbase	300 mm (12.0")	450 mm (18.0")

Given the potential for wet subgrade conditions, site assessments may be required at the time of construction to determine what options can be undertaken to construct a stable driveway and parking lot base. These options may include subexcavation and increasing the thickness of the Granular 'B' subbase, the use of reinforcing geotextile and/or geogrid, or a combination of all. As such, it is recommended that provisions for subexcavation and disposal of wet soils, importing and placing additional Granular 'B' (OPSS 1010), as well as supply and placement of a reinforcing geotextile (Terrafix 200W or equivalent) and geogrid (Tensar BX1200 or equivalent) should be included in the tender documents.

Frost tapers must be constructed at any changes from light traffic to heavy traffic areas. If heavy traffic routes are not delineated by barriers or if it is anticipated that heavy equipment (such as loaders and dump trucks) will be utilized for snow removal, it would be recommended that the heavy traffic pavement structure be utilized throughout.

Construction joints in the surface asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Where new asphalt is joined into existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 40 mm and a width of 150 mm as per OPSD 509.010. It is recommended that a tackcoat in conformance with OPSS 308 be applied to the edge and surface of all milled asphalt prior to placement of new asphalt.

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

The pavement should be designed to ensure that water will not pond on the pavement surface. If the surface asphalt is not placed within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is strongly recommended that the surface asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that, currently, asphalt mixes tend to be more flexible and, as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The damage can occur from both passenger vehicles as well as large vehicles. The condition is further intensified during hot weather. In high traffic/tight turning areas, it is recommended that rigid portland cement pavement be considered.

5.12 Chemical Analysis/Excess Soil Management

Generally if surplus soils are to be exported off-site, it will be necessary to perform chemical analysis of the soils. An environmental study was performed by XCG Consulting Limited, which should be referred to for the chemical analysis and excess soil management recommendations.

5.13 Storm Water Infiltration

As part of the geotechnical investigation, gradation analyses were performed on samples of the native silt and sand/sand and silt with trace to some gravel and clay. The following table provides the sample location (borehole number), sample depth, corresponding estimated coefficient of permeability (k) as well as soil type:

Borehole No.	Depth (m)	Estimated Coefficient of Permeability (k) cm/s	Soil Type
2	7.62 – 9.14	$<1.0 \times 10^{-6}$	silt and sand, some clay, trace gravel (ML)
5	1.52 - 2.13	6.25×10^{-6}	sand and silt, some gravel, trace clay (SM)
8	1.52 - 2.13	9.61×10^{-6}	sand and silt, some gravel, trace clay (SM)

Based on the grain size distribution curves and the estimated coefficient of permeability, as well as the generally dense to very dense nature, the native silt and sand/sand and silt encountered in the boreholes are not considered conducive to storm water infiltration.

The very dense glacial till soils encountered in the lower zone of boreholes have the potential to create perched water conditions which can result in wet to saturated zones as observed in the boreholes. Perched water conditions are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume.

We understand that the project layout and location of any potential infiltration galleries are not finalized yet. If infiltration galleries are to be included in the project design, once the location of the potential infiltration galleries is determined, additional sampling and/or laboratory testing may be required. Samples are generally stored for three months unless other arrangements are made.

5.14 Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock and water. When radon escapes the earth in the outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most homes have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new home will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a home, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that *"Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control".*

6.0 SITE INSPECTIONS

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed development.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Prepared by:

for

Shawn Wheatley, B.Sc

LICENSED PROFESSIONAL ENGINEER
May 1/18
R. KOOPMANS
PROVINCE OF ONTARIO

Reviewed by:

Robert Koopmans, P.Eng.
Consulting Engineer

NOTES:

Base map provided by Google Maps

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:

Two 12 Storey Apartment Buildings
1242, 1250, and 1260 Gordon St.
Guelph, Ontario

DRAWING TITLE:

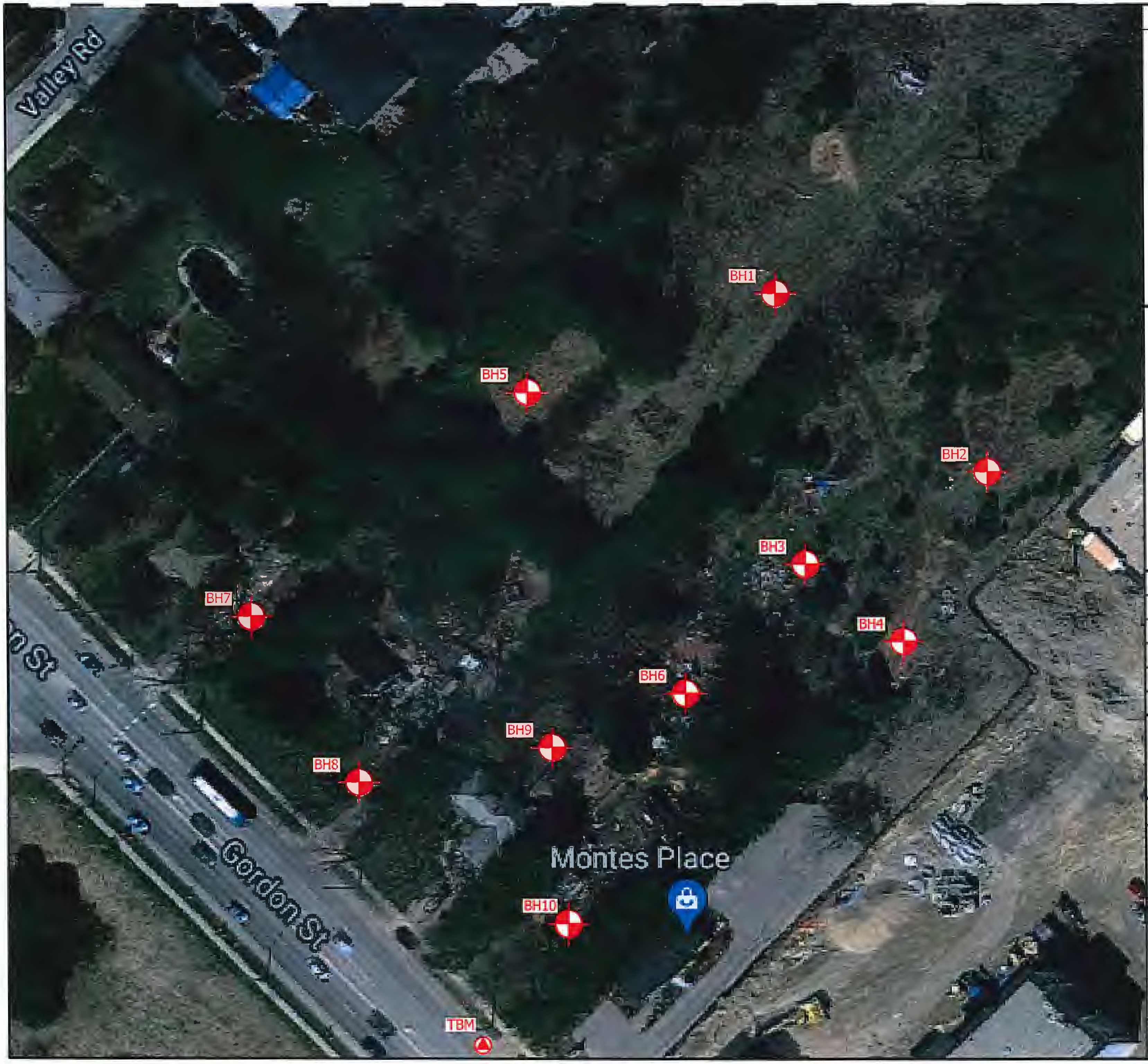
SITE LOCATION MAP

PROJECT NO.: 18-099

DATE: April 19, 2018

SCALE: N.T.S.

DRAWING NO. 1



NOTES:

1. This drawing is for information purposes only. Locations and sizes of existing and proposed structures are approximate only, and should not be used for construction.
2. Base image is provided by Google Maps
3. Temporary Benchmark: top of Manhole 'H', on Gordon Street across from House #1260 Reported elevation = 336.21 m

N

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:

Two 12 Storey Apartment Buildings
1242, 1250, and 1260 Gordon St.
Guelph, Ontario

DRAWING TITLE:

SITE PLAN SHOWING
BOREHOLE LOCATIONS

PROJECT NO.: 18-099

DATE: April 19, 2018

SCALE: N.T.S.

DRAWING NO. 2

APPENDIX A

BOREHOLE LOGS

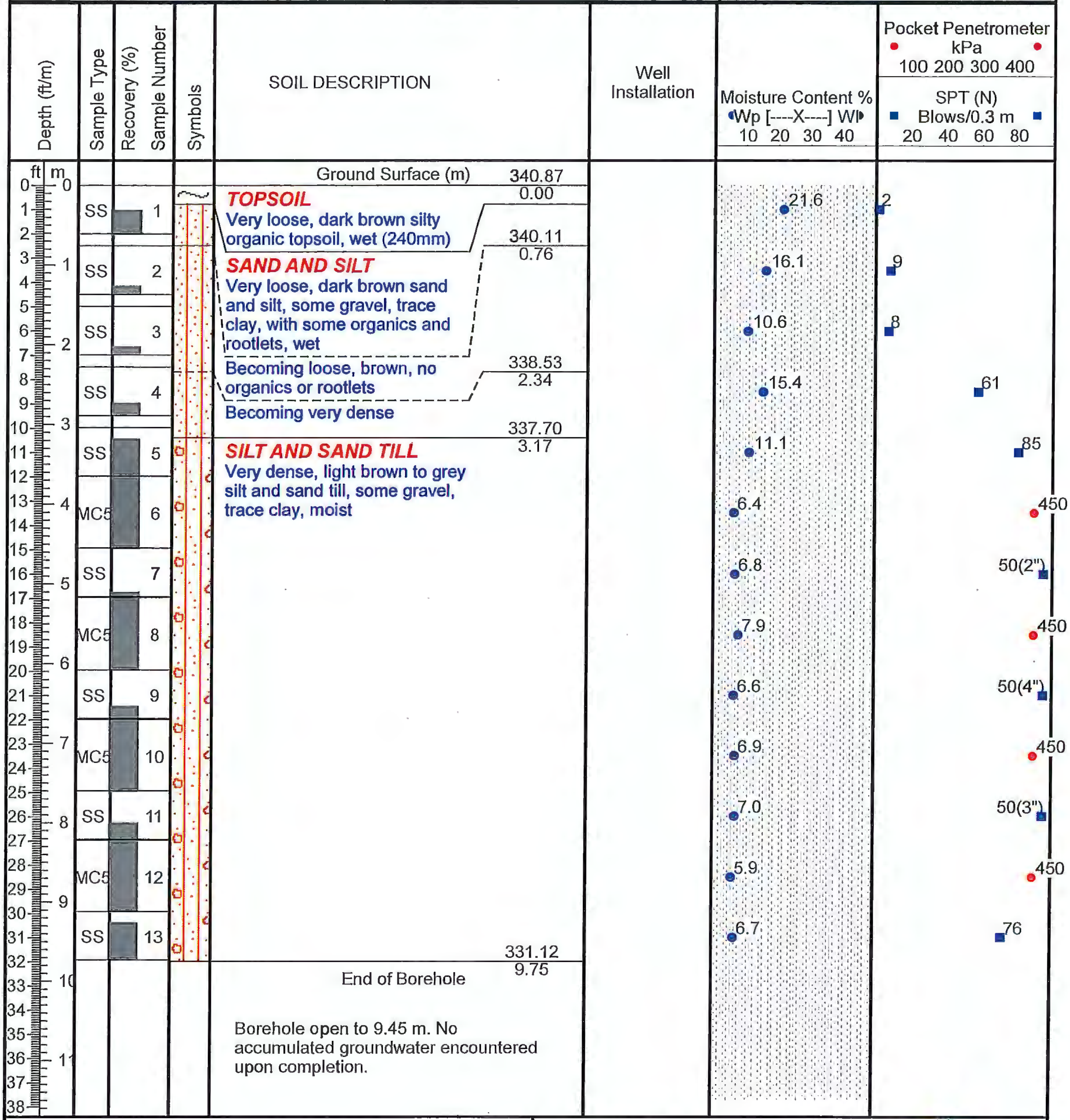
BOREHOLE 1

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.87 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Elevation (m)	Depth (m)	Soil Description
340.87		Ground Surface (m)
	0.00	**TOPSOIL** Very loose, dark brown silty organic topsoil, wet (240mm)
340.11	0.76	**SAND AND SILT** Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet
338.53	2.34	Becoming loose, brown, no organics or rootlets Becoming very dense
337.70	3.17	**SILT AND SAND TILL** Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist
331.12	9.75	End of Borehole

Borehole open to 9.45 m. No accumulated groundwater encountered upon completion.

SS	1	21.6		2
SS	2	16.1		9
SS	3	10.6		8
SS	4	15.4		61
SS	5	11.1		85
MC5	6	6.4	450	
SS	7	6.8		50(2")
MC5	8	7.9	450	
SS	9	6.6		50(4")
MC5	10	6.9	450	
SS	11	7.0		50(3")
MC5	12	5.9	450	
SS	13	6.7		76

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

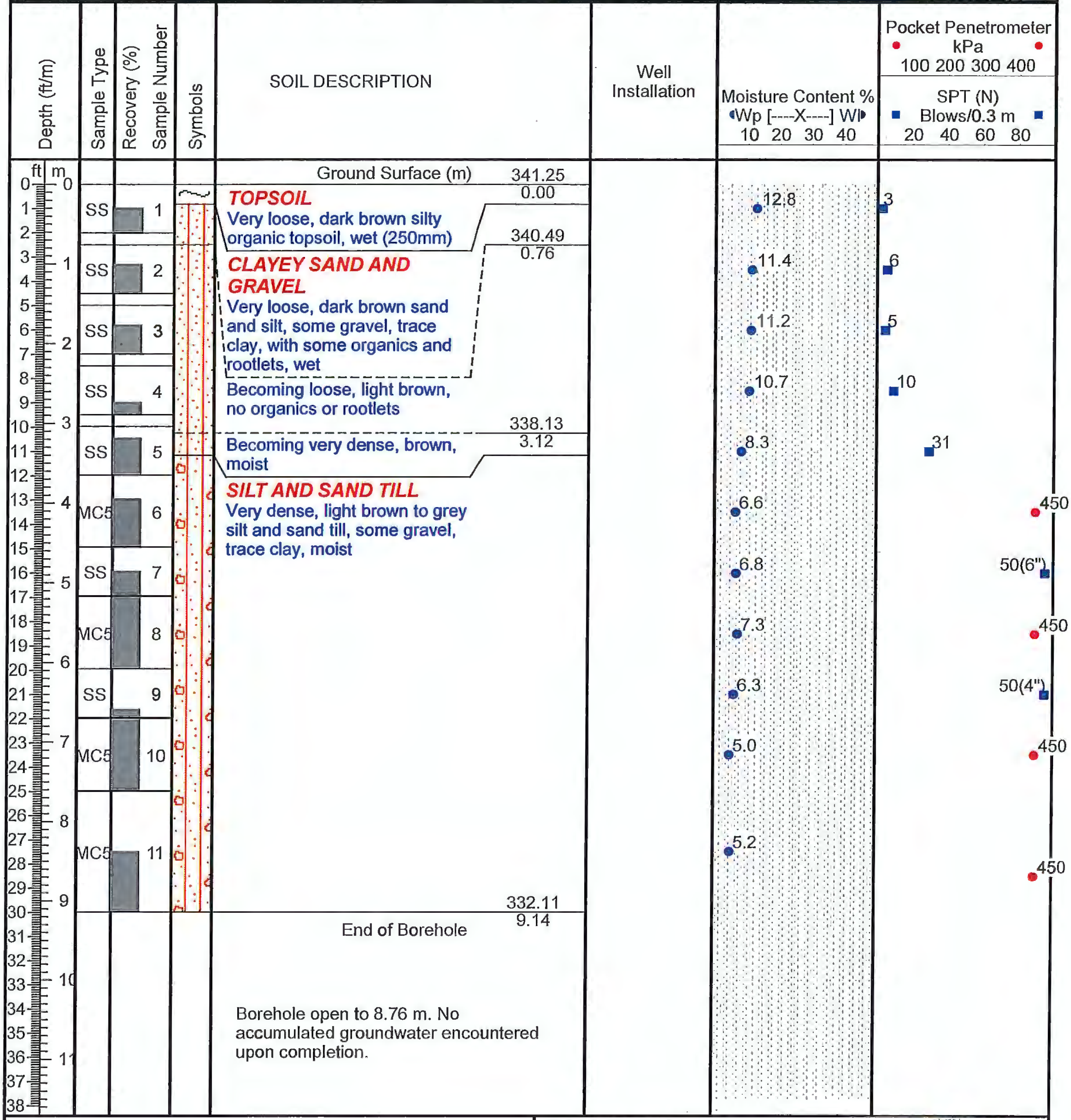
BOREHOLE 2

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 341.25 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m) 341.25

0.00
TOPSOIL
Very loose, dark brown silty organic topsoil, wet (250mm)

340.49
0.76
CLAYEY SAND AND GRAVEL
Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming loose, light brown, no organics or rootlets

338.13
3.12
Becoming very dense, brown, moist

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist

332.11
9.14
End of Borehole

Borehole open to 8.76 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	12.8	3	
SS	2	11.4	6	
SS	3	11.2	5	
SS	4	10.7	10	
SS	5	8.3	31	
MC5	6	6.6		450
SS	7	6.8	50(6")	
MC5	8	7.3		450
SS	9	6.3	50(4")	
MC5	10	5.0		450
MC5	11	5.2		450

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

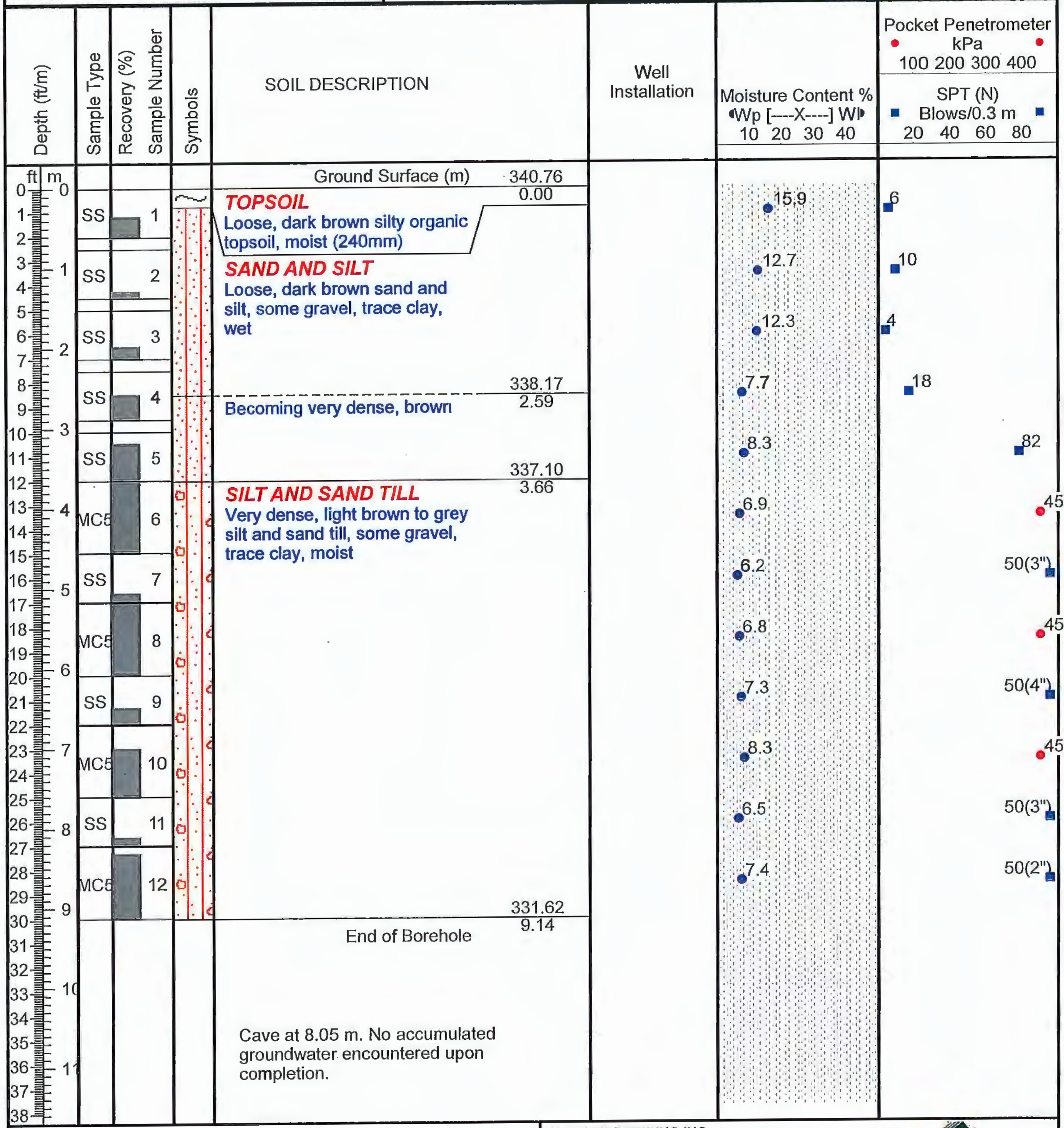
BOREHOLE 3

Page 1 of 1

Date Drilled: April 17, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.76 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m) 340.76

0.00

TOPSOIL
Loose, dark brown silty organic topsoil, moist (240mm)

SAND AND SILT
Loose, dark brown sand and silt, some gravel, trace clay, wet

338.17
2.59

Becoming very dense, brown

337.10
3.66

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist

331.62
9.14

End of Borehole

Cave at 8.05 m. No accumulated groundwater encountered upon completion.

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

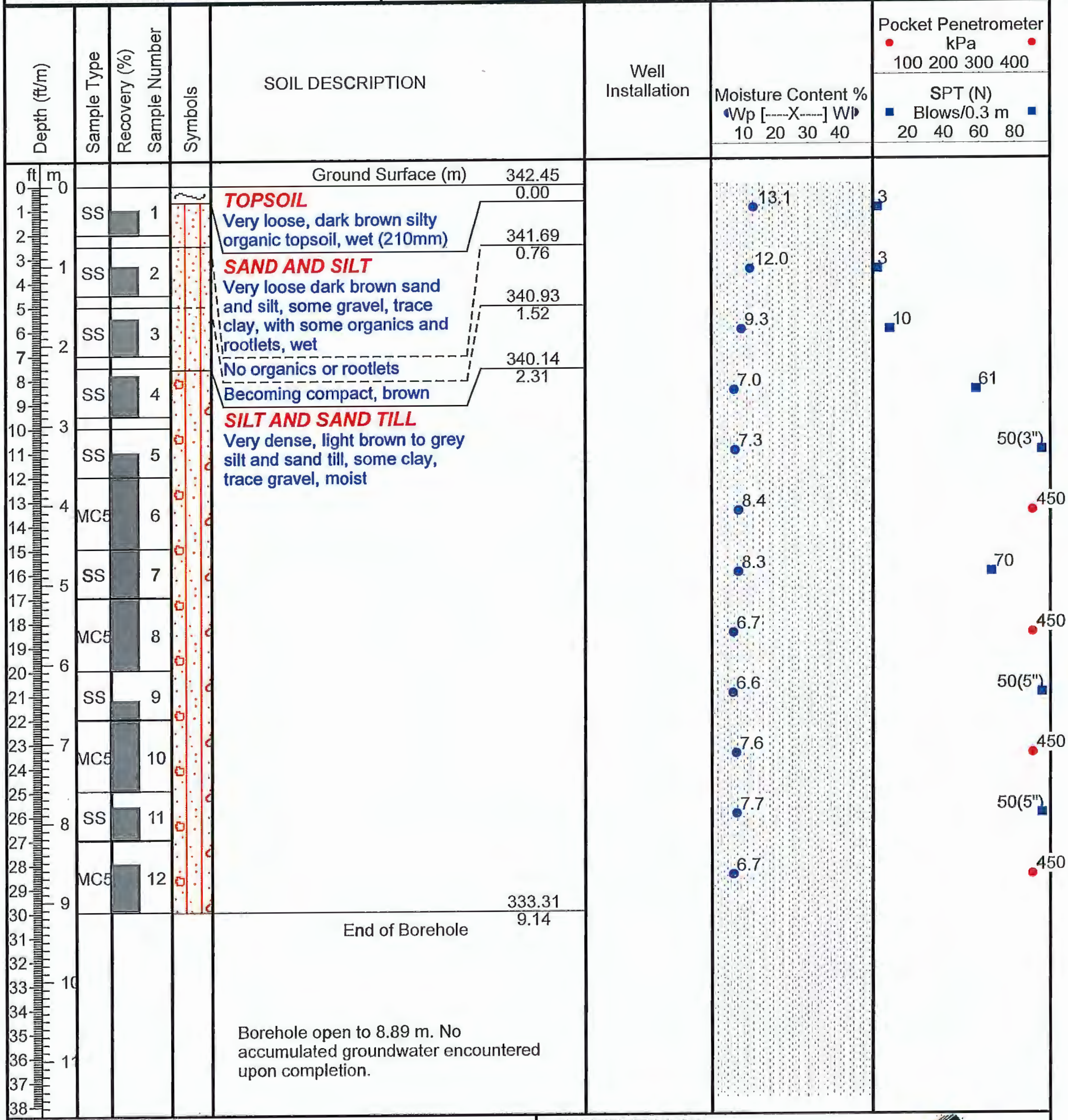
BOREHOLE 4

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 342.45 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



SOIL DESCRIPTION	Elevation (m)	Depth (m)
Ground Surface (m)	342.45	0.00
TOPSOIL Very loose, dark brown silty organic topsoil, wet (210mm)	341.69	0.76
SAND AND SILT Very loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet No organics or rootlets	340.93	1.52
Becoming compact, brown	340.14	2.31
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	333.31	9.14
End of Borehole		

Sample Type	Sample Number	Moisture Content %	SPT (N) Blows/0.3 m	Pocket Penetrometer kPa
SS	1	13.1	3	
SS	2	12.0	3	
SS	3	9.3	10	
SS	4	7.0	61	
SS	5	7.3	50(3")	
MC5	6	8.4		450
SS	7	8.3	70	
MC5	8	6.7		450
SS	9	6.6	50(5")	
MC5	10	7.6		450
SS	11	7.7	50(5")	
MC5	12	6.7		450

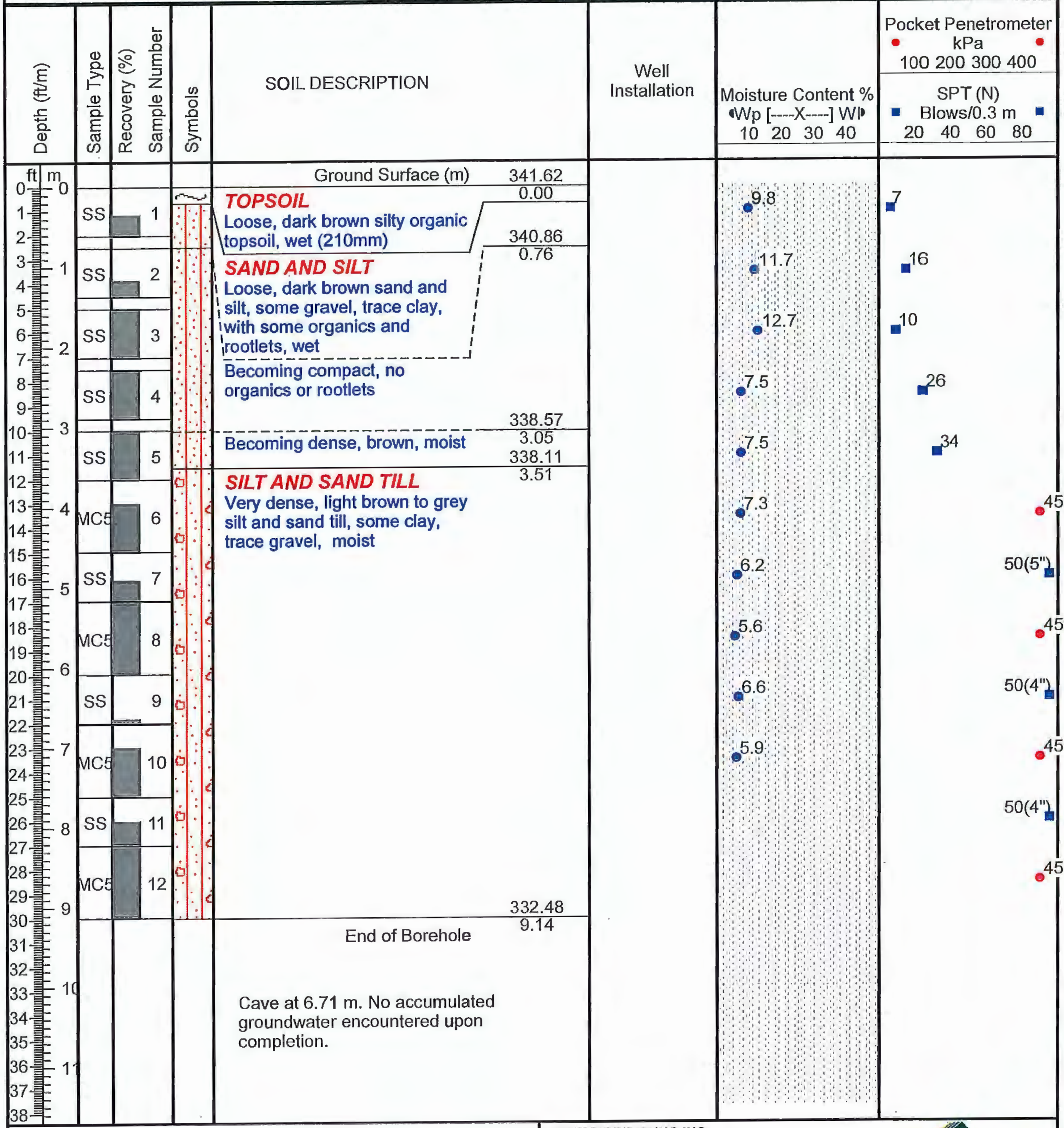
Borehole open to 8.89 m. No accumulated groundwater encountered upon completion.

BOREHOLE 5

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 341.62 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer (kPa)
SS	1	9.8	7	
SS	2	11.7	16	
SS	3	12.7	10	
SS	4	7.5	26	
SS	5	7.5	34	
MC5	6	7.3		450
SS	7	6.2	50(5")	
MC5	8	5.6		450
SS	9	6.6	50(4")	
MC5	10	5.9		450
SS	11		50(4")	
MC5	12			450

Ground Surface (m) 341.62

0.00

TOPSOIL
Loose, dark brown silty organic topsoil, wet (210mm)

340.86
0.76

SAND AND SILT
Loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming compact, no organics or rootlets

338.57
3.05

Becoming dense, brown, moist

338.11
3.51

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

332.48
9.14

End of Borehole

Cave at 6.71 m. No accumulated groundwater encountered upon completion.

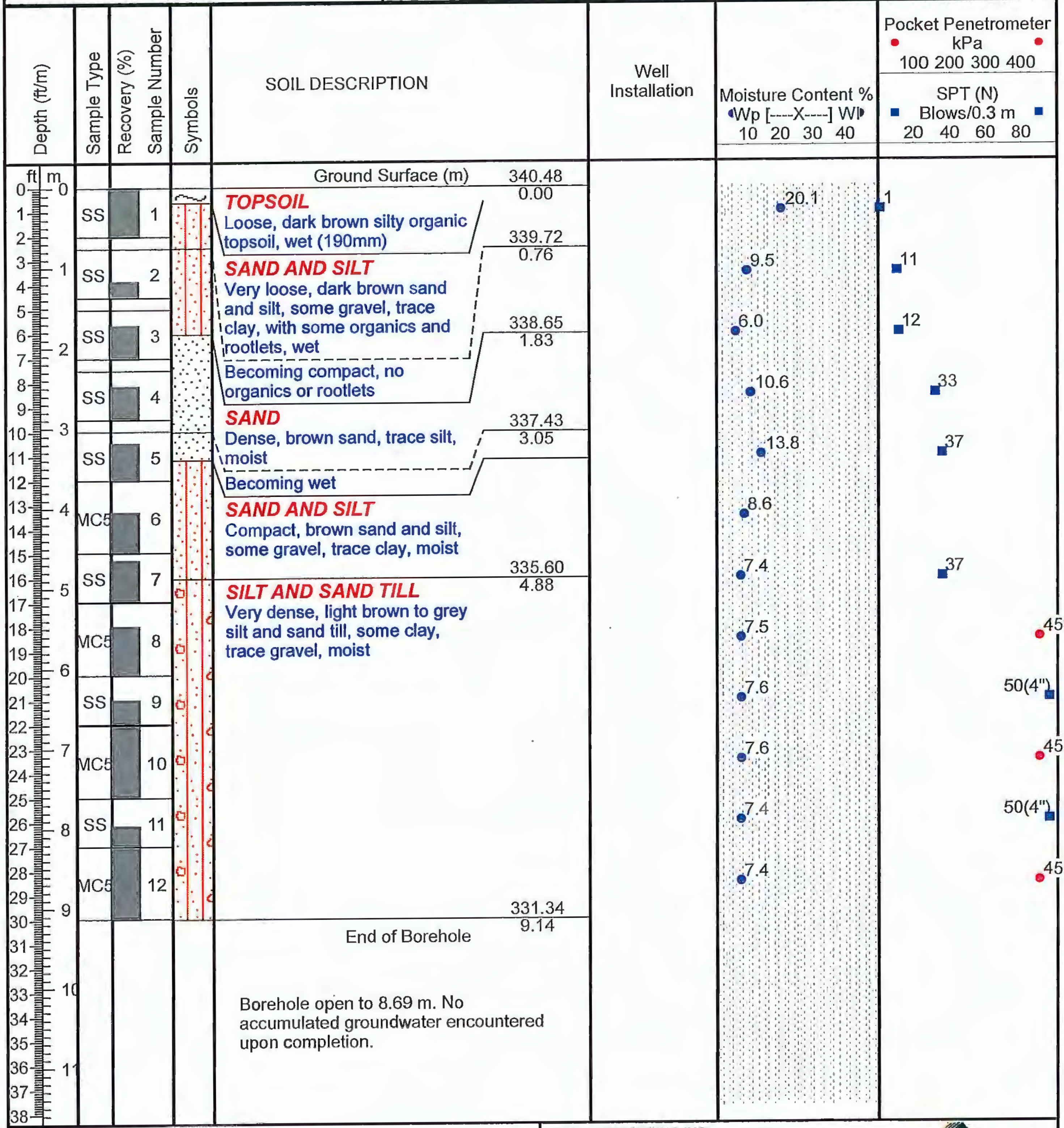
BOREHOLE 6

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.48 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Soil Description	Elevation (m)	Depth (m)
Ground Surface (m)	340.48	0.00
TOPSOIL Loose, dark brown silty organic topsoil, wet (190mm)	339.72	0.76
SAND AND SILT Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet Becoming compact, no organics or rootlets	338.65	1.83
SAND Dense, brown sand, trace silt, moist Becoming wet	337.43	3.05
SAND AND SILT Compact, brown sand and silt, some gravel, trace clay, moist	335.60	4.88
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	331.34	9.14

End of Borehole

Borehole open to 8.69 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	20.1	1	
SS	2	9.5	11	
SS	3	6.0	12	
SS	4	10.6	33	
SS	5	13.8	37	
MC5	6	8.6		
SS	7	7.4	37	
MC5	8	7.5		450
SS	9	7.6	50(4")	
MC5	10	7.6		450
SS	11	7.4	50(4")	
MC5	12	7.4		450

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

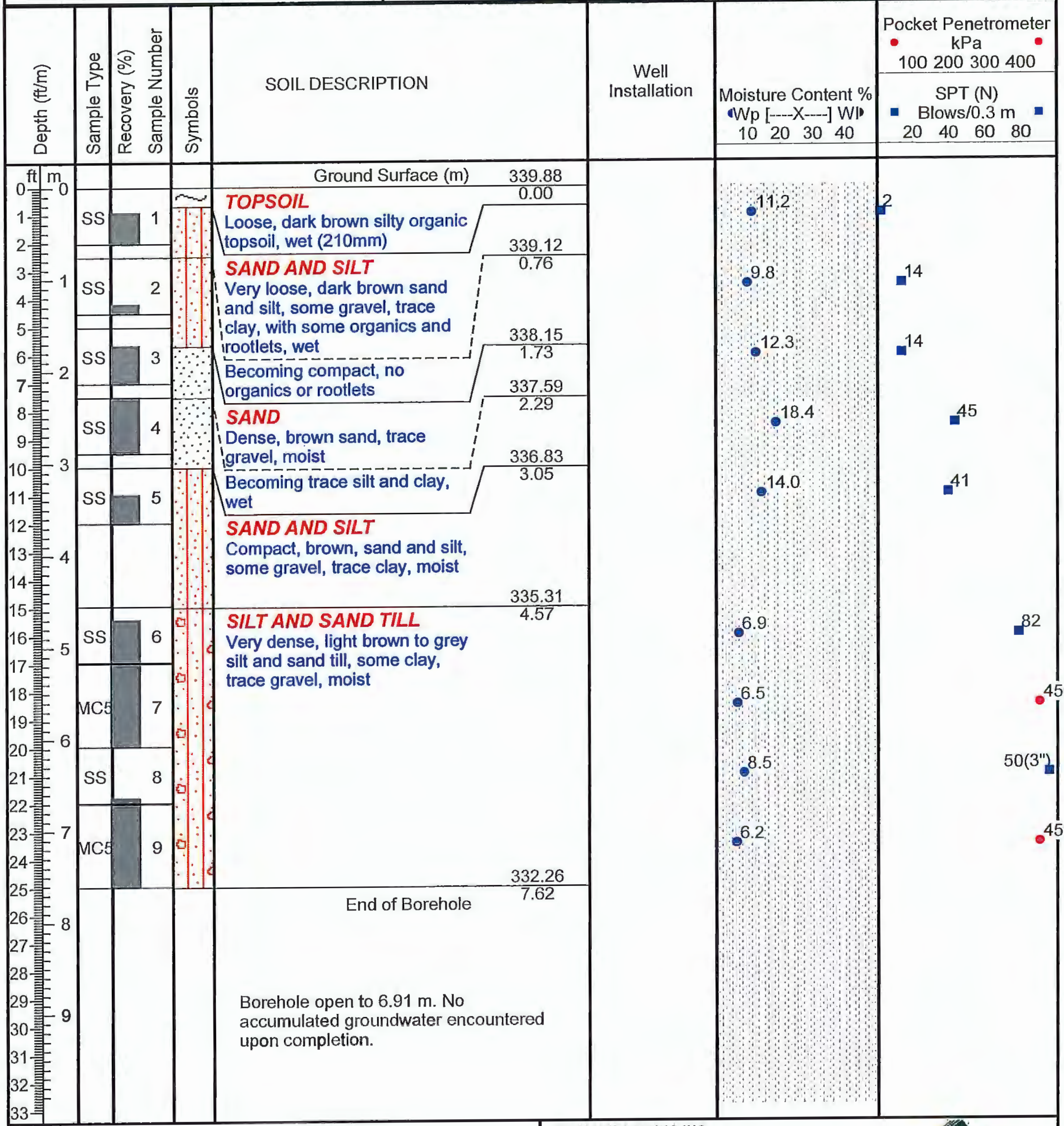
BOREHOLE 7

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 339.88 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



SOIL DESCRIPTION		
Ground Surface (m)	339.88	0.00
TOPSOIL Loose, dark brown silty organic topsoil, wet (210mm)	339.12	0.76
SAND AND SILT Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet	338.15	1.73
Becoming compact, no organics or rootlets	337.59	2.29
SAND Dense, brown sand, trace gravel, moist	336.83	3.05
Becoming trace silt and clay, wet		
SAND AND SILT Compact, brown, sand and silt, some gravel, trace clay, moist	335.31	4.57
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	332.26	7.62
End of Borehole		

Sample Type	Sample Number	Moisture Content %	Pocket Penetrometer kPa	SPT (N) Blows/0.3 m
SS	1	11.2		2
SS	2	9.8		14
SS	3	12.3		14
SS	4	18.4		45
SS	5	14.0		41
SS	6	6.9		82
MC5	7	6.5	450	
SS	8	8.5		50(3")
MC5	9	6.2	450	

Borehole open to 6.91 m. No accumulated groundwater encountered upon completion.

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

BOREHOLE 8

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 338.04 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON

SOIL DESCRIPTION

Ground Surface (m) 338.04

0.00

SAND AND SILT

Compact, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

337.28
0.76

No organics or rootlets

336.52
1.52

Becoming dense, brown, moist

335.75
2.29

SILT AND SAND TILL

Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

330.42
7.62

End of Borehole

Borehole open to 7.47 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N) Blows/0.3 m	Pocket Penetrometer kPa
SS	1	7.5	17	
SS	2	11.4	11	
SS	3	8.8	30	
SS	4	6.7	57	
SS	5	7.2	50(6")	
MC5	6	6.5		450
SS	7	6.4	50(6")	
MC5	8	6.3		450
SS	9	7.6	50(3")	
MC5	10	8.5		450

Depth (ft/m) · Recovery (%) · Symbols · Well Installation

Moisture Content % Wp [----X----] Wl 10 20 30 40

Pocket Penetrometer kPa 100 200 300 400

SPT (N) Blows/0.3 m 20 40 60 80

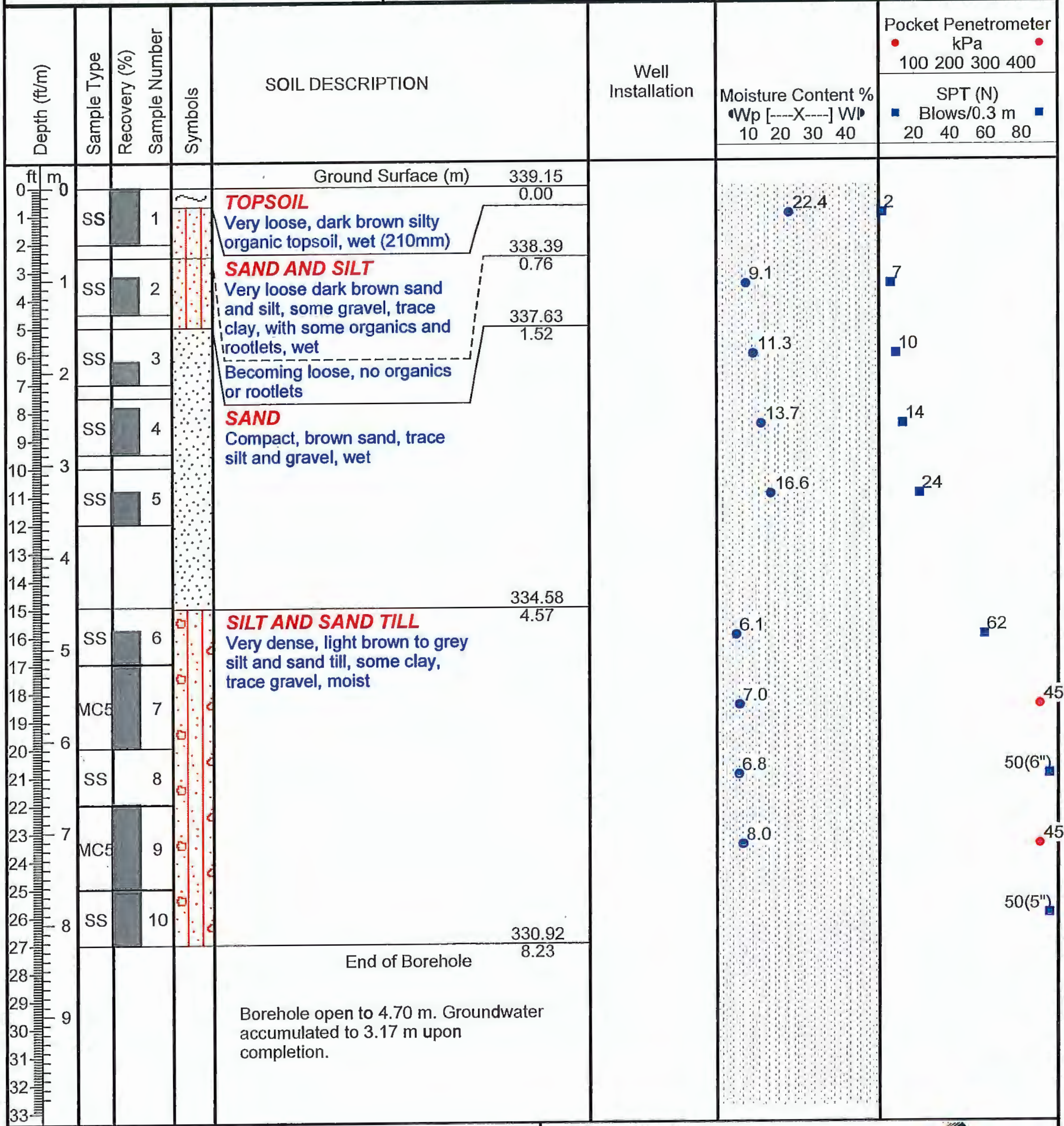
BOREHOLE 9

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 339.15 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m)	339.15
	0.00

TOPSOIL
Very loose, dark brown silty organic topsoil, wet (210mm)

338.39	0.76

SAND AND SILT
Very loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming loose, no organics or rootlets

337.63	1.52

SAND
Compact, brown sand, trace silt and gravel, wet

334.58	4.57

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

330.92	8.23

End of Borehole

Borehole open to 4.70 m. Groundwater accumulated to 3.17 m upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	22.4	2	
SS	2	9.1	7	
SS	3	11.3	10	
SS	4	13.7	14	
SS	5	16.6	24	
SS	6	6.1	62	
MC5	7	7.0		450
SS	8	6.8	50(6")	
MC5	9	8.0		450
SS	10		50(5")	

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

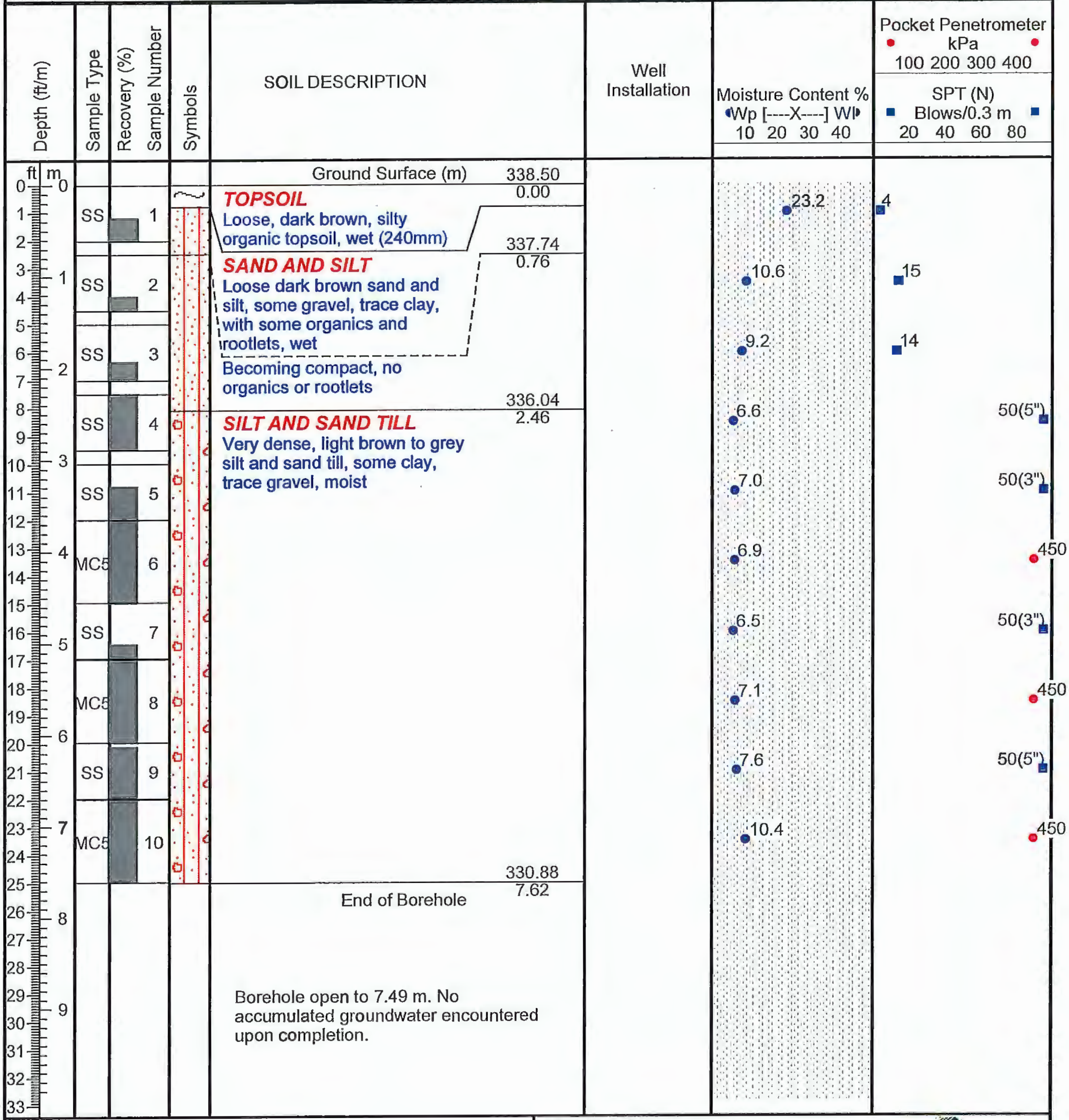
BOREHOLE 10

Page 1 of 1

Date Drilled: April 17, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 338.50 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m) 338.50
0.00

TOPSOIL
Loose, dark brown, silty organic topsoil, wet (240mm)

337.74
0.76

SAND AND SILT
Loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming compact, no organics or rootlets

336.04
2.46

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

330.88
7.62

End of Borehole

Borehole open to 7.49 m. No accumulated groundwater encountered upon completion.

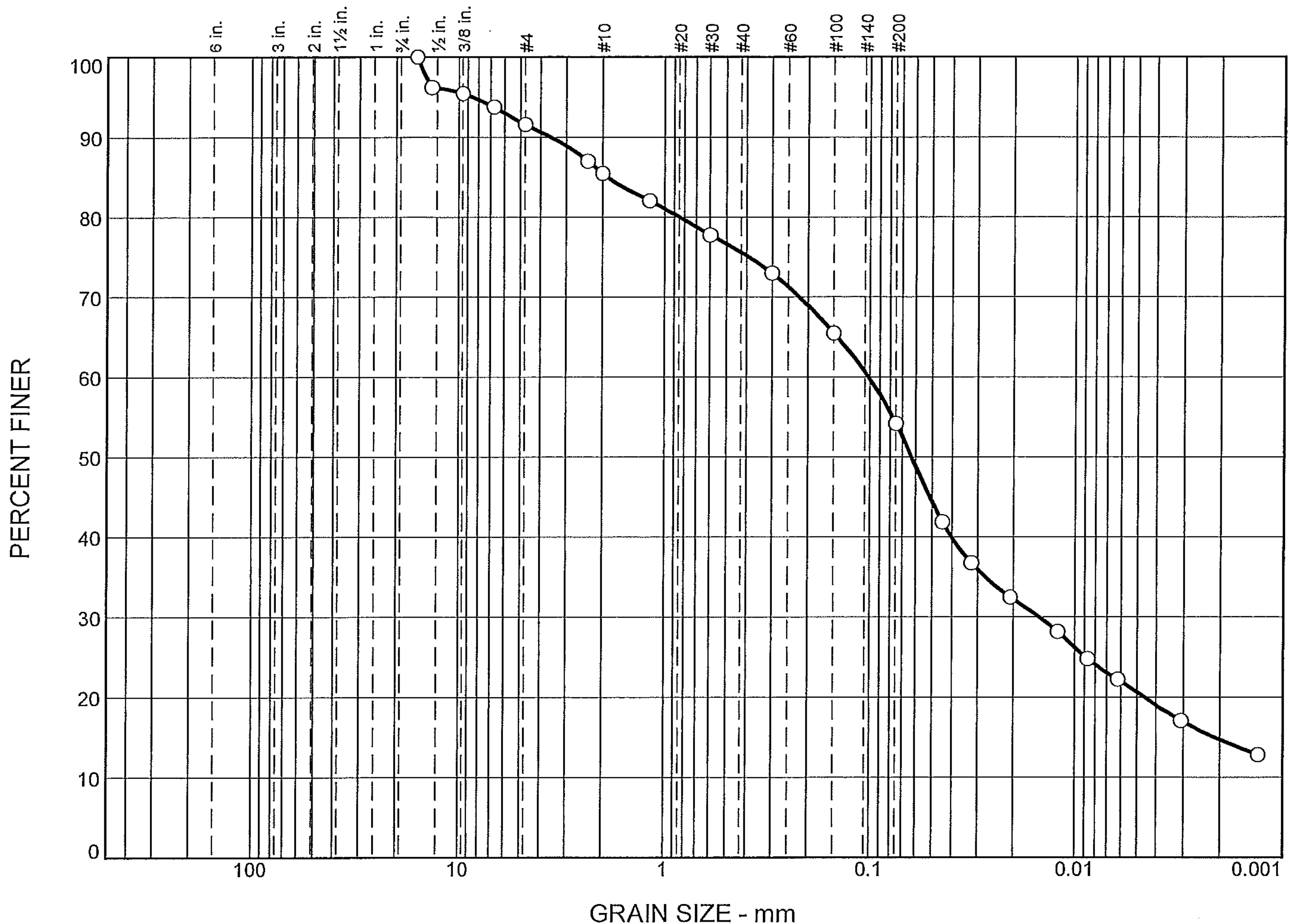
SS	1	23.2	4
SS	2	10.6	15
SS	3	9.2	14
SS	4	6.6	50(5")
SS	5	7.0	50(3")
MC5	6	6.9	450
SS	7	6.5	50(3")
MC5	8	7.1	450
SS	9	7.6	50(5")
MC5	10	10.4	450

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

APPENDIX B

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	8.4	6.1	9.9	21.4	39.5	14.7

SOIL DATA

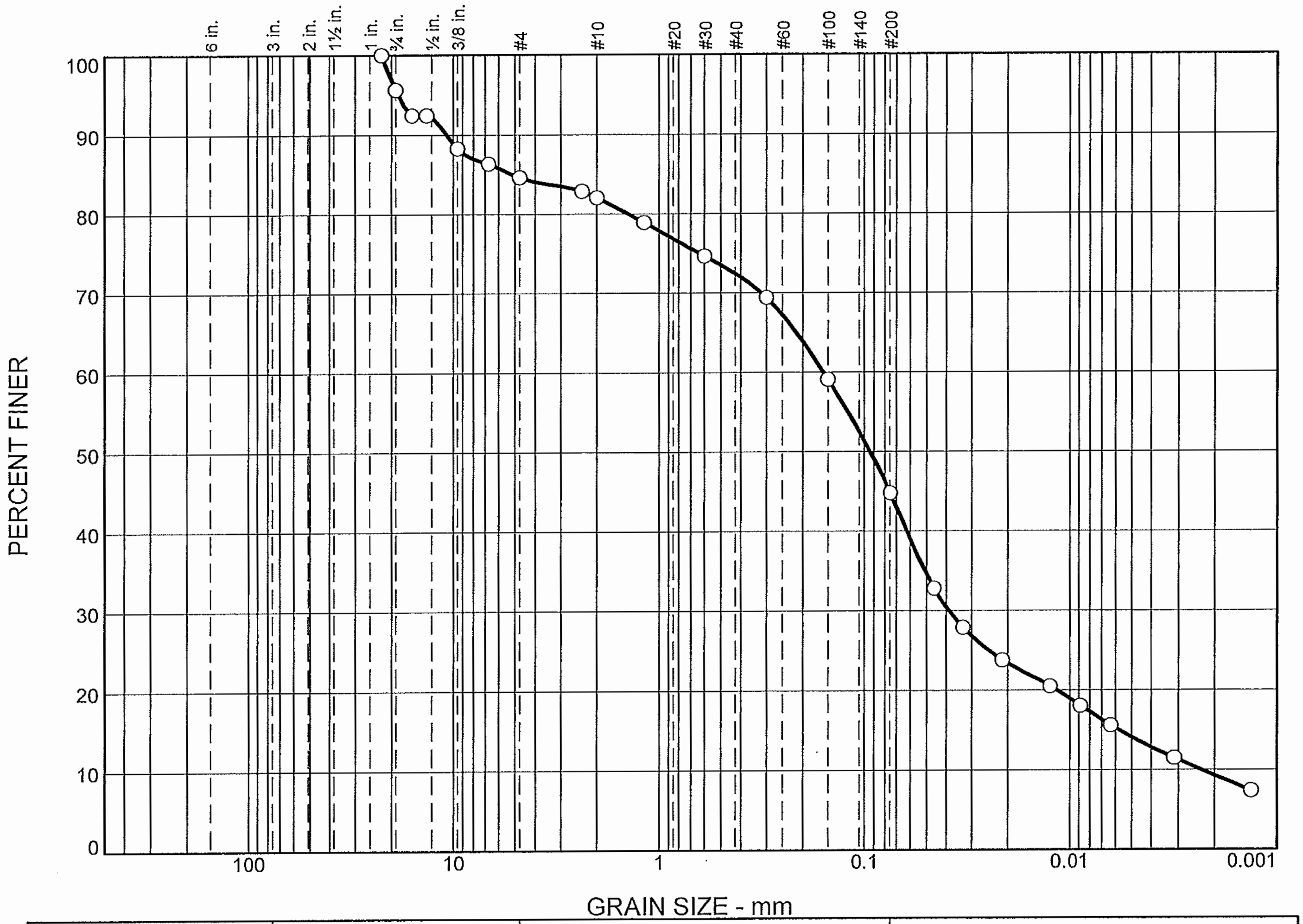
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH2	11	7.62-9.14m	silt and sand, some clay, trace gravel	ML
				Tested by MS of CMT Engineering Inc., April 23, 2018	
				Estimated coefficient of permeability k < 1.0x10^-6 cm/sec	

CMT Engineering Inc.

St. Clements, ON

Client: XCG Consulting Limited
Project: Two 12-Storey Apartment Buildings
1242, 1250 and 1260 Gordon Street, Guelph, Ontario
Project No.: 18-099 **Figure** 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.3	11.1	2.6	9.5	27.7	35.5	9.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH5	3	1.52-2.13m	sand and silt, some gravel, trace clay	SM
				Tested by MS of CMT Engineering Inc., April 23, 2018	
				Estimated coefficient of permeability k = 6.25x10^-6 cm/sec	

CMT Engineering Inc.

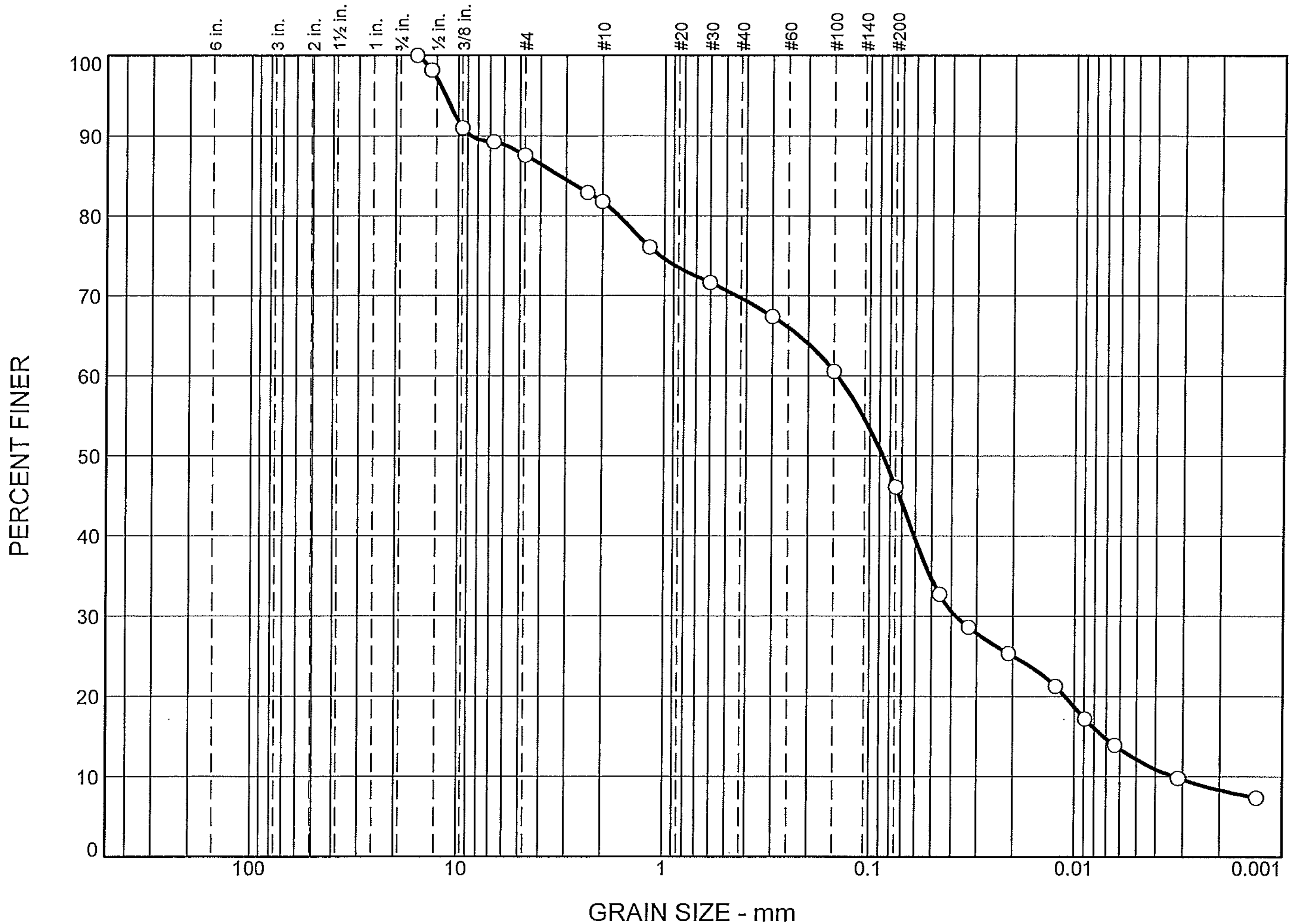
St. Clements, ON

Client: XCG Consulting Limited

Project: Two 12-Storey Apartment Buildings
1242, 1250 and 1260 Gordon Street, Guelph, Ontario

Project No.: 18-099 **Figure** 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.4	5.8	12.1	23.6	37.8	8.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH8	3	1.52-2.13m	sand and silt, some gravel, trace clay	SM
				Tested by MS of CMT Engineering Inc., April 23, 2018	
				Estimated coefficient of permeability k < 9.61x10^-6 cm/sec	

CMT Engineering Inc.

St. Clements, ON

Client: XCG Consulting Limited

Project: Two 12-Storey Apartment Buildings
1242, 1250 and 1260 Gordon Street, Guelph, Ontario

Project No.: 18-099 **Figure** 3

APPENDIX E
HYDROGEOLOGICAL ASSESSMENT

Hydrogeological Assessment

1242, 1250 and 1260 Gordon Street
and 9 Valley Road
City of Guelph, ON

FINAL REPORT

May 4, 2020

Prepared for:

Tricar Developments Inc.
3800 Colonel Talbot Road
London, ON N6P 1H5

Prepared by:

Stantec Consulting Ltd.
100-300 Hagey Blvd.
Waterloo, ON N2L 0A4

File: 161413684

Author		**Quality Check**		**Independent Review**	
Grant Whitehead	2020-04-12	Roger Freymond	2020-04-14	Chris Hendriksen	2020-04-14

Sign-off Sheet

This document entitled Hydrogeological Assessment, 1242, 1250 and 1260 Gordon Street and 9 Valley Road, City of Guelph, ON was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Tricar Developments Inc. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by G. Whitehead
(signature)

Grant Whitehead, MES, P.Geo. (Limited)
Senior Hydrogeologist

Reviewed by ______________________
(signature)

Roger Freymond, P.Eng.
Senior Hydrogeologist

Table of Contents

LIST OF APPENDICES

APPENDIX G: HYDRAULIC CONDUCTIVITY SOLUTIONS

APPENDIX H: DEWATERING CALCULATIONS

APPENDIX I: SSP THREAT POLICY APPLICABILITY MAPPING

APPENDIX J: CORRESPONDENCE WITH CITY OF GUELPH

Abbreviations

AMSL	above mean sea level
ASTM	American Society for Testing and Materials
BGS	below ground surface
City	City of Guelph
EASR	Environmental Activity Sector Registry
GRCA	Grand River Conservation Area
GRIN	Grand River Information Network
GUDI	Groundwater Under the Direct Influence of Surface Water
DNAPL	dense non-aqueous phase liquid
GUDI	Groundwater Under the Direct Influence
HDPE	high-density polyethylene
HVA	Highly Vulnerable Aquifer
ID	inside diameter
IPZ	Intake Protection Zone
LID	Low Impact Development
Maxxam	Maxxam Analytics Inc.
MECP	Ontario Ministry of the Environment, Conservation and Parks
ODWQS	Ontario Drinking Water Quality Standards
ORP	oxidation reduction potential
PTTW	Permit to Take Water
PVC	polyvinyl chloride

Site	1242, 1250 & 1260 Gordon Street, within the City of Guelph, Ontario
SGRA	Significant Groundwater Recharge Area
Stantec	Stantec Consulting Ltd.
Tricar	Tricar Developments Inc.
WHPA	Well Head Protection Area

1.0 INTRODUCTION

Tricar Developments Inc. (Tricar) retained Stantec Consulting Limited (Stantec) to complete a hydrogeological investigation of the property located at 1242, 1250 & 1260 Gordon Street, within the City of Guelph, Ontario (Site) (Figure 1). The Site is approximately 2.8 hectares (ha) in size and is bounded to the northwest by existing residential subdivision, to the northeast by protected woodlot affiliated with the Torrance Creek Swamp, to the southeast by existing high-density development (i.e., Liberty Square apartment complex), and to the southwest by Gordon Street.

The purpose of the hydrogeological investigation is to support Zoning By-law and Official Plan Amendments and the Site Plan Application to permit the construction of the proposed residential development, which will consist of two 12 story apartment buildings having nine townhouse units and 368 apartment units. The development will have a combination of surface parking and two levels of underground parking. The proposed underground parking footprint will cover an area of approximately 11,450 m^2, with the anticipated base of the underground parking garage being located at an elevation of 335.7 m AMSL.

As per input provided by the City of Guelph (City) (2018) (Appendix J), this hydrogeological assessment consists of meeting the following objectives:

- Characterize current geological and hydrogeological conditions at the Site, including a discussion of overburden and bedrock stratigraphy, hydrostratigraphic units, seasonal fluctuations in groundwater levels and hydraulic gradients, flow direction across the Site, soil infiltration potential, and groundwater quality conditions.
- Evaluate the hydraulic relationship between the groundwater system present beneath the Site and the adjacent Torrance Creek Swamp and assess whether the future development of the Site could potentially disrupt the hydrogeological form and/or function of this wetland.
- Evaluate pre-development infiltration volumes at the Site and assess the impact that proposed land use changes could potentially have on these volumes under the post-development condition, including an evaluation of potential measures that could be employed throughout the Site under the post-development condition to mitigate these impacts.
- Assess whether proposed buildings, site servicing and associated construction activities will intercept the groundwater table and if construction dewatering may be required and assess whether any measures are required to mitigate these potential disturbances to pre-development groundwater levels, flow patterns, and groundwater-surface water interactions.
- Evaluate whether proposed land use activities conform to Source Water Protection requirements as stipulated in the Clean Water Act, S.O. 2006, Chapter 22.

This report is arranged into nine sections, including this introduction (Section 1). Section 2 presents the physical setting of the Site at a regional scale. Section 3 outlines the methods utilized to evaluate the Site hydrogeological conditions. Section 4 presents the results of the Site investigation, with Section 5 presenting the water balance assessment. Section 6 presents the groundwater dewatering assessment and Section 7 discusses the potential hydrogeological impacts of the project and recommended mitigation measures. Report conclusions and references are listed in Sections 8 and 9, respectively. All figures and tables referenced in this report are presented in Appendices A and B, respectively. Appendices C to J include Regional Groundwater Flow Mapping, Regional Groundwater Recharge Mapping, Borehole Logs, Laboratory Certificates of Analysis, Hydraulic Conductivity Analytical Solutions, Dewatering Calculations, Source Protection Plan Threat Policy Applicability Mapping, and City of Guelph Correspondence, respectively.

2.0 PHYSICAL SETTING

2.1 PHYSIOGRAPHY AND TOPOGRAPHY

The Site is situated within the physiographic region referred to by Chapman and Putnam (1984) as the Guelph Drumlin Field. The Guelph Drumlin Field consists of a series of broad oval type hills with axes trending in a northwest to southeast direction (i.e., drumlins). As shown in Figure 2, most of the Site is situated upon a drumlin, which is further supported by the regional topographic setting (Figure 3). The drumlins and associated till plain of the physiographic region consist of stony, calcareous till derived from dolostone of the Goat Island and Gasport Formations (formerly referred to as the Amabel Formation) and consists of sand (50%; average content based on grain-size analysis completed on till samples), silt (35%) and clay (15%) (Chapman and Putnam, 1984). The drumlin groupings occur in swampy valleys that are flanked by terraced spillway channels of sand and gravel, which contain tributaries of the Grand River (e.g., Torrance Creek Swamp located northeast of the Site; Figure 2). Gravel ridges or eskers are also known to cut through the till plain in the same general direction as the drumlins.

Most of the Site lies within the Torrance Creek subwatershed (Totten Sims Hubicki Associates *et al.*, 1998), with the southwestern portions of the property being located within the Upper Hanlon Creek Watershed (Golder, 2011; Gamsby & Mannerow, 1993). Both subwatersheds occur within the Grand River Watershed and are under the jurisdiction of the Grand River Conservation Authority (GRCA). The Torrance Creek subwatershed is characterized by hummocky terrain associated with the drumlins and by the network of broad, relatively flat spillway channels that cut through the drumlin fields. As shown on Figure 3, topographic high points occur along the northwestern and southeastern boundaries within the central portion of the Site, with the topography generally sloping to the northeast towards Torrance Creek Swamp and the southwest towards Gordon Street. As shown on Figure 1, topographic contours throughout the Site range from highs of 344.5 m AMSL near Valley Road (northwest boundary) and 342.5 m AMSL near Borehole 4 (southeast boundary), to lows of 337 m AMSL near Gordon Street and 335 m AMSL along the northeast boundary of the Site near Torrance Creek Swamp.

As shown on Figure 15 and discussed in the Functional Servicing Report (Stantec, 2020), the direction of surface water runoff occurring within the Site under existing conditions is split between two catchments. Catchment 101 directs surface water runoff westward to an existing storm sewer on Gordon Street, whereas surface water runoff occurring within Catchment 102 flows overland to the east and eventually discharges to Torrance Creek Swamp.

2.2 REGIONAL GEOLOGY AND HYDROSTRATIGRAPHY

Geological conditions within the region have been mapped and described by Matrix Solutions Inc. (2017), the Lake Erie Region Source Protection Committee (LERSPC, 2015a), Golder Associates Limited (2011), Totten Sims Hubicki Associates *et al.* (1998), Gamsby & Mannerow (1993), and Jagger Hims Limited (1998). Based on these previous studies, overburden and bedrock geology near the Site is summarized as follows, listed from youngest to oldest:

Organic Deposits: Accumulations of peat and/or muck associated with wetland areas (Figure 4, Unit 20).

Glaciofluvial Deposits: Glaciofluvial outwash and glaciolacustrine deposits of sand and gravel with minor silt and clay associated with the spillway channels (Figure 4, Units 7a and 7b).

Ice-Contact Deposits: Predominantly sand and gravel containing lenses of silt and clay left behind by the melting of enclosed ice blocks (i.e., eskers, kames) (Figure 4, Unit 6).

Port Stanley Till: An occasionally stony, silty sand to sandy silt till, forming the till plain and drumlins that characterize the region (Figure 4, Unit 5b). Some of the drumlins, however, can consist of an older clayey silt till core that is subsequently covered by a veneer of Port Stanley Till (Karrow, 1968). In the areas south of the Speed River, the till plain is often covered by a layer of glaciofluvial and glaciolacustrine sediments (i.e., fine to silty sand, sandy silt, sand and gravel) deposited from melting glacier ice, with the till extending to the bedrock surface.

Bedrock: The Eramosa Formation (Reformatory Quarry Member), representing the uppermost bedrock unit beneath the Site is described as a light brown to cream coloured, pseudonodular, thickly bedded and coarsely crystalline dolostone, which may act as an aquitard (Brunton, 2008). As per Golder (2011), the bedrock surface near the Site appears to be located at an elevation of 320 m AMSL and will not be encountered with the proposed development.

2.3 REGIONAL HYDROGEOLOGY

Based on previous groundwater modeling work completed by Matrix Solutions Inc. (2017), the following aquifer and aquitard systems are identified as occurring throughout the region in which the Site resides:

Upper Sand and Gravel Aquifer: an unconfined aquifer system consisting predominantly of outwash sand and gravel deposits. This unit is reported to have a horizontal hydraulic conductivity ranging from 7.0 x 10^{-4} m/s to 6.0 x 10^{-6} m/s, with the vertical hydraulic conductivity being one tenth (0.1) to an order (1.0) of magnitude lower than the horizontal hydraulic conductivity (Golder, 2011). Soil permeability testing using a Guelph Permeameter indicates that the sandy soils of this unit have vertical hydraulic conductivities in the range of 10^{-5} m/s (Totten Sims Hubicki Associates *et al.*, 1998).

Lower Till Aquitard: dense sandy to silty glacial till (i.e., Port Stanley Till) that is occasionally interbedded with discontinuous lenses of coarse sand and gravel. This unit is reported to have a horizontal hydraulic conductivity ranging from 1.0 x 10^{-4} m/s to 2.0 x 10^{-9} m/s, with the vertical hydraulic conductivity being one half (0.5) to an order (1.0) of magnitude lower than the horizontal hydraulic conductivity (Golder, 2011).

Contact Zone Aquifer: coarse, unconsolidated granular deposits directly overlying, and hydraulically connected to, upper weathered/fractured bedrock. This unit typically forms a thin aquifer having an assumed thickness of four meters (two meters above and below bedrock surface) (Golder, 2011). This aquifer is reported to have a horizontal hydraulic conductivity ranging from 1.0 x 10^{-4} m/s to 1.0 x 10^{-5} m/s, with the vertical hydraulic conductivity being one half (0.5) to an order (1.0) of magnitude lower than the horizontal hydraulic conductivity (Golder, 2011).

Bedrock Aquifer: consisting of medium to thick bedded fossiliferous dolostone of the Guelph Formation. This unit is reported to have a horizontal hydraulic conductivity ranging from 8.0 x 10^{-3} m/s to 7.0 x 10^{-9} m/s, with the vertical hydraulic conductivity being one tenth (0.1) to an order (1.0) of magnitude lower than the horizontal hydraulic conductivity (Golder, 2011).

As presented in Figure 4.3 of Matrix Solutions Inc. (2017) (Appendix C), simulated groundwater table surface elevations produced via a calibrated steady-state groundwater flow model suggests that regional groundwater movement is to the northwest through the overburden aquifer located beneath the Site, eventually discharging to the Speed River. However, groundwater flow interpretations presented in Totten Sims Hubicki Associates *et al.* (1998) (Figure 4.4.7, Appendix C) suggest that at a local scale, groundwater movement through the shallow overburden near the Site is to the northeast and east, with these flows potentially being influenced by pumping from the Burke and/or Carter Municipal Production Wells.

Regionally, the lands containing the Site are characterized by groundwater recharge conditions. Mapping created using the Grand River Information Network (GRIN) (GRCA, 2019) indicates that downward vertical hydraulic gradients are present beneath the Site, with annual recharge rates across the property ranging from 100 to 200 mm/year (Appendix D).

2.4 SOURCE WATER PROTECTION

As established under the Ontario Clean Water Act, 2006, S.O., 2006, c. 22, source protection areas and associated land use restrictions exist for all municipal drinking water sources located throughout the Grand River Source Protection Area (i.e., defined by the boundaries of the Grand River Watershed). Within the Source Protection Area (SPA), the Ministry of the Environment, Conservation and Parks (MECP) has designated four types of vulnerable areas that apply to drinking water sources:

Wellhead Protection Areas (WHPA): an area delineated on the ground surface that represents the capture zone for the underlying aquifer in which a given municipal well draws its water. The zone represents the total amount of time it would take for groundwater to flow through the aquifer system and reach the intake of a given municipal well. The zones are defined as follows:

- WHPA-A: 100 m radius around the municipal well.
- WHPA-B: Time of travel to the municipal well is two years or less.
- WHPA-C: Time of travel to the municipal well is equal to or less than five years and greater than two years.
- WHPA-D: Time of travel to the municipal well is equal to or less than 25 years and greater than five years.

- WHPA-E: Area where groundwater is under the direct influence of surface water (GUDI), where time of travel to the municipal well is two hours or less from the surface water body to the well.

As shown on Figure 5, the Site is located within the WHPA for the Burke Municipal Production Well (Burke Well), with this production well being located approximately 165 m to the southwest of the Site. Specifically, the Site is intercepted by Burke Well WHPA-B and -C, noting that the footprint for the proposed development is confined to the WHPA-C (i.e., representing an area where it takes greater than two years but less than five years for precipitation that has recharged the aquifer to flow through this aquifer to the production well intake). The WHPA-C has an assigned vulnerability score ranging from four (4) to six (6) (Figure 6). Development on municipal services in areas where vulnerability scores are in the 4 to 6 range represent a low threat to drinking water supplies.

The northeastern portion of the Site also lies within the WHPA-E (vulnerability score of 7.2, MECP, 2020; Figure 7) of the Burke Well, with this well being classified as Groundwater Under the Direct Influence (GUDI) of surface water (i.e., a surface water source has a direct connection to the groundwater system and is drawn into the production well during pumping). The extents of the WHPA-E are equivalent to the area of an Intake Protection Zone (IPZ); that is, a capture zone delineated for those drinking-water systems that obtain their potable water from surface water bodies. The WHPA-E is equivalent to an IPZ-3, which represents surface water bodies and adjacent lands (i.e., GRCA Regulation Limit or 120 m, whichever is greater) that may be impacted by extreme events such as storms (e.g., 100-year rainfall event) and, subsequently, potentially contribute surface water to the municipal well. For the Burke Well, the IPZ-3 encompasses the nearby Torrance Creek Swamp.

Significant Groundwater Recharge Areas (SGRA): This is an area where it is desirable to regulate drinking water threats that may affect recharge of an aquifer. Recharge areas are classified as “significant” when they supply more water to an aquifer used as a drinking water source than the surrounding area. As shown in Figure 8, the SGRA represents an area where the rate of annual recharge to the underlying aquifer system is greater than the average annual rate of recharge within the Grand River SPA by a factor of 1.15 or more (i.e., at least 15% greater than the average recharge rate). Based on the modeling results presented in AquaResource (2009), the average annual rate of recharge within the Grand River SPA is calculated to be 176 mm/year; consequently, a SGRA threshold is defined as an area within the watershed where the annual recharge rate equals or is greater than 202 mm/year. A similar SGRA threshold of 200 mm/year was calculated for those lands located within the City of Guelph and Township of Guelph/Eramosa as described in Matrix Solutions Inc. (2017). For the Site, the SGRA is assigned a vulnerability score of four (4), indicating that activities occurring in this area of the property that limit recharge to the underlying aquifer pose a moderate threat to groundwater quantities in the aquifer, which is or may be used as a source of drinking water.

Highly Vulnerable Aquifers (HVA): Defined as subsurface, geologic formations that are sources of drinking water, which could be easily affected by the release of pollutants on the ground surface. The HVA is identified using variables that include depth to the aquifer, physical properties of the overlying soil and/or rock, and the aquifer composition. In general, an HVA will consist of granular aquifer materials (i.e., sands and gravels) that are exposed near the ground surface and where a relatively shallow groundwater table is present. As per the mapping provided by the MECP (2020), the Site does not occur in an area defined as HVA.

Intake Protection Zones (IPZ): A zone established around a drinking / surface water intake within which a spill or leak may get to the intake too quickly for the operators of the municipal water treatment plant to shut the intake down until the pollutant passes by. These zones also include land adjacent to streams and storm sewers where surface water runoff can quickly reach the intake. As discussed above, the northeastern portion of the Site is intercepted by an IPZ-3.

3.0 METHODOLOGY

The hydrogeological site investigation included the:

- drilling of boreholes
- installation of monitoring wells
- installation of drive-point piezometers
- monitoring of groundwater levels
- collection of groundwater samples for quality testing
- performing hydraulic response (hydraulic conductivity) testing

The methodology for these tasks is described in Section 3.1 to 3.5 below.

3.1 BOREHOLE DRILLING AND MONITORING WELL INSTALLATIONS

Between July 9 and 30, 2018 boreholes were advanced at seven locations across the Site (Figure 1). Five of the locations involved the drilling of a borehole, which was then equipped with a single monitoring well (i.e., MW1-18 to MW3-18, MW6-18, MW7-18). The remaining two locations involved the installation of a multi-level monitoring well (i.e., MW4-18(S/D) and MW5-18(S/D)) where two boreholes (one shallow and one deep) were drilled within meters of each other, with each of these boreholes then being equipped with a single monitoring well. Overall, the boreholes were strategically positioned throughout the Site to obtain a spatially representative understanding of soil conditions, groundwater depths and fluctuations, and to evaluate local patterns of groundwater flow.

Stantec on behalf of Tricar retained Aardvark Drilling Inc. to complete the borehole drilling and monitoring well installations. The boreholes were drilled using a CME track-mounted drilling rig equipped with a hollow stem auger drilling system (i.e., to permit the installation of monitoring wells). Soil samples were collected using split-spoon sampling techniques. Soil sampling occurred using a 0.6 m long stainless-steel split spoon sampler at 0.75 m (2.5 feet) intervals for the first 6.0 m (20 feet) of drilling depth, followed by sample collection occurring at approximately every 1.5 m (5 feet) to the termination depth of the borehole. The completed depths of the boreholes ranged from 12.8 m to 15.8 m below ground surface (BGS). Stantec personnel directed the drilling and soil sampling operations and logged the borehole stratigraphy using the American Society for Testing and Materials (ASTM) guideline for the description and identification of soils (ASTM, 2009). The borehole logs contain descriptions (where relevant and possible) of soil type, texture, colour, structure, consistency, plasticity, moisture content, and other visual and olfactory observations. Copies of the borehole logs are provided in Appendix E.

The drilling contractor installed the monitoring wells adhering to the construction requirements as outlined under Ontario Regulation 903 (O.Reg. 903) (MOE, 1990). Installation details for each of the monitoring wells are summarized in Table 1. Each monitoring well is constructed of 50 mm inside diameter, Schedule 40 polyvinyl chloride (PVC) pipe, having a No. 10 slot screen (0.01-inch slot) measuring 3.0 m in length. Backfilling of the screened interval consisted of silica sand to a height of approximately 0.3 m above the top of screen, followed by granular bentonite to ground surface prevent a hydraulic connection from occurring between the screened formation and overlying soils. The completion of each monitoring well involved encasing the pipe stick-up within a lockable steel casing. Stantec Geomatics surveyed the ground surface and top-of-pipe elevations at each monitoring well location to a geodetic benchmark using the Can-Net GPS Survey system, having a spatial accuracy of +/- 0.03 m and +/- 0.02 m in the vertical and horizontal plane, respectively.

Following installation, Stantec personnel purged each monitoring well using dedicated 16 mm (2/3 inch) inside diameter high density polyethylene (HDPE) tubing connected to a D-25 Waterra™ foot valve. Using the dedicated tubing, Stantec personnel purged 10 standing column volumes from each well (where possible) to clear out any fine-grained sediments and, subsequently, establish a proper hydraulic connection with the native aquifer material.

3.2 DRIVE-POINT PIEZOMETER INSTALLATIONS

On April 10, 2019 Stantec personnel installed one multi-level drive-point piezometer, consisting of a shallow and a deep piezometer (i.e. DP1-19(S) and DP1-19(D)), within a section of the Torrance Creek Swamp located approximately 65 m to the northeast of the Site (Figure 1). The multi-level piezometer was installed to evaluate whether this wetland functions as a groundwater recharge feature (i.e., contributes water to subsurface), discharge feature (receives water from the subsurface), or a combination of both.

Each drive-point piezometer is constructed of a 0.42 m long steel screen (19 mm diameter) that is connected to 25 mm diameter steel riser pipes. Stantec personnel drove the drive-point piezometers into the substrate using a fence post driver, with shallow and deep pipes being constructed within one meter of each other and their screens being separated by a vertical distance of approximately 1.7 m. Construction details for the drive-point piezometers are summarized in Table 1.

3.3 GROUNDWATER LEVEL MONITORING

Groundwater levels were recorded at the monitoring well and piezometer locations from July 2018 to January 2020 using a combination of automated and manual measurement methods. Solinst® Edge Leveloggers® (Leveloggers) were installed at all monitoring well and piezometer locations to allow automatic measurement of water levels. The Leveloggers were suspended into the water column at each monitoring well and drive-point piezometer and set to record water levels at 60-minute intervals. Leveloggers are not vented to the atmosphere and therefore record total pressure (where total pressure is the sum of the atmospheric pressure and the height of water column). To obtain an accurate measurement of the groundwater level at each well, the water level data obtained from the Leveloggers were corrected for atmospheric pressure using data obtained from a Solinst® Edge Barologger® (Barologger), which was suspended in the air column at monitoring well MW5-18(S).

Groundwater levels were manually measured several times from the onsite monitoring wells (eight events) and the multi-level drive-point piezometer (five events) between July 2018 and January 2020. The groundwater level measurements were recorded in metres to the nearest 0.01 m using a battery-operated water level indicator. Manual groundwater level measurements were used to verify data recorded by the Leveloggers. Manual water levels collected from the monitoring wells and drive-point piezometer are presented in Tables 2 and 3, respectively. Hydrographs presenting both the automatic and manually measured groundwater level data are provided in Figures 9 and 10.

3.4 GROUNDWATER SAMPLING AND TESTING

Groundwater quality samples were collected from MW2-18, MW4-18(S), MW6-18 and MW7-18 on September 11, 2018. The samples were collected to help evaluate pre-development groundwater quality conditions at the Site. Specifically, all samples were analyzed for general inorganic parameters and dissolved metals and compared against their corresponding Ontario Drinking Water Quality Standard (ODWQS) (MOE, 2006) concentrations, with MW2-18 results being compared against those parameters listed under the City of Guelph Sanitary and Storm Sewer By-law (1996)-15202.

Stantec personnel collected groundwater samples from the onsite monitoring wells using dedicated HDPE tubing connected to a foot valve. Prior to collecting the samples, wells were purged and field parameters including pH, temperature, electrical conductivity, oxidation reduction potential (ORP), and dissolved oxygen (DO) were monitored periodically during the purging process using a multi-parameter water quality meter and flow through cell. The meter was calibrated prior to use according to the manufacturer’s specifications with the appropriate calibration standards. Groundwater sampling occurred after these field parameter concentrations had stabilized, indicating that water being pumped from the monitoring wells was representative of groundwater flowing into the well from surrounding geological formations.

The groundwater sample collected from each monitoring well consisted of pouring water directly from the HDPE tubing into lab supplied sample bottles. Groundwater samples collected for metals analysis were field-filtered using disposable in-line 0.45 µm (micron) filters attached to the HDPE tubing. The groundwater samples were carefully packed into coolers with ice, which was added to maintain sample temperatures below 10ºC during transport to the analytical laboratory. Samples were delivered to Maxxam Analytics Inc. (Maxxam) for analysis. Chain of custody forms were completed and included with the samples.

The results of the groundwater quality testing are summarized in Tables 4 (ODWQS) and 5 (Sewer By-law) and illustrated in a piper diagram on Figure 11. A copy of the Laboratory Certificate of Analysis is presented in Appendix F.

3.5 HYDRAULIC RESPONSE TESTING

Stantec performed in-situ hydraulic response testing at each monitoring well between July 26 and 27, 2018 to estimate the horizontal hydraulic conductivity of the deposits beneath the Site. The testing consisted of creating an instantaneous change in the well water level by removing a known volume of water followed by recording the time taken for the water level to return to static conditions (i.e., a rising head or bail test). Data were analyzed using the Bouwer and Rice (1976) solution for a bail test in an unconfined aquifer as provided in the software package AQTESOLV™ Pro Version 4.5 (Duffield, 2014). Testing provided an estimate of the horizontal hydraulic conductivity of the sediments within the screened interval for each monitoring well. Table 1 provides a summary of the calculated horizontal hydraulic conductivities, with the analytical solutions for the data being presented in Appendix G.

Since hydraulic conductivity in the horizontal direction is generally an order (potentially two orders for clay-based deposits) of magnitude higher than hydraulic conductivity in the vertical direction (Todd 1980; Freeze and Cherry 1979), the vertical hydraulic conductivities for overburden deposits surrounding the well screens were assumed to be one order of magnitude lower than in-situ measured horizontal hydraulic conductivities calculated at MW01 to MW03 and MW05 to MW12. Infiltration rates were calculated based on an established relationship between vertical hydraulic conductivity and infiltration rate presented in the Credit Valley Conservation and Toronto and Region Conservation Authority (CVC-TRCA, 2010) Low Impact Stormwater Management Planning and Design Guideline - Version 1.0. Table 4 provides a summary of estimated infiltration rates based on the results of the horizontal hydraulic conductivity testing.

4.0 LOCAL GEOLOGY AND HYDROGEOLOGY

4.1 GEOLOGY

Figure 4 presents the surficial geology throughout the Site as mapped by the OGS (2010), with this mapping indicating that the entire Site is covered by stone-poor, silty to sandy glacial till (i.e., the Port Stanley Till). Figure 1 shows the locations of Cross-Section A-A’ (Figure 12) and B-B’ (Figure 13), which were constructed using geological information obtained from the onsite drilling completed at the Site by CMT Engineering (2018) and Stantec (Appendix E). Although onsite drilling results confirm that silty sand to sandy silt till (Port Stanley Till) predominantly forms a horizontally and vertically contiguous unit beneath the Site, this unit is overlain by a 2.3 to 4.8 m thick diamicton deposit consisting of very loose to dense sand and silt, with some gravel and trace clay (CMT, 2018). A 2.4 m thick, discontinuous layer of sand was encountered in the Port Stanley Till at a depth of 11.3 m BGS (331.7 m AMSL) at MW2-18. The Port Stanley Till occurs at elevations ranging from 341.6 to 334.7 m AMSL beneath the Site, with this unit extending to the termination depth of the onsite boreholes (333.4 to 324.6 m AMSL). Locally, the bedrock surface is reported to occur at an elevation of approximately 320 m AMSL (Golder, 2011).

4.2 HYDROGEOLOGY

4.2.1 Groundwater Levels and Flow

Figures 9 and 10 and Table 2 present the continuous and manual water levels recorded within the monitoring wells between July 2018 and January 2020. Groundwater elevations across the Site ranged from 1.0 m BGS (at MW5-18) to 9.2 m BGS (at MW1-18) over the monitoring period, equating to elevations ranging from 332.6 m to 340.7 m AMSL.

As shown in the hydrographs (Figures 9 and 10), the groundwater table demonstrated a similar pattern in fluctuations across the Site, with high groundwater conditions predominantly occurring in the spring (i.e., early March to early June) as a result of lower evapotranspiration losses and a melting snowpack, which in turn provided a greater volume of water available to infiltrate and recharge the groundwater system. Starting in mid-June, the groundwater table across the entire Site begins to experience a steady decline, reaching its lowest elevation in late October to early November as a response to more water being drawn from the subsurface over this period to meet evapotranspiration demands. Overall, the groundwater table decline that occurred from the early summer to late fall at the monitoring well locations ranged from 1.4 m (MW7-18) to 5.6 m (MW2-18).

Throughout the Site, groundwater levels showed no marked response to notable precipitation events (i.e., immediate spike/rise in the groundwater table), suggesting that there is no direct hydraulic connection between the ground surface and the groundwater system (i.e., via fissures/fractures in the shallow overburden). The subdued response to precipitation events is also not surprising, given that the largely dense to very densely packed deposits of silty sand to sandy silt present are beneath the Site, which are characterized by lower permeability having horizontal hydraulic conductivities in the range of 10^{-7} to 10^{-9} m/s (Table 1; Appendix G).

Figure 14 presents groundwater elevation contours and the interpreted direction of horizontal flow through the groundwater system beneath the Site using level measurements collected from the on-site monitoring wells in May 2019. In general, groundwater contours mimic the prevailing topography of the Site, with a localized groundwater divide running along the northeast-southwest axis of the drumlin upon which the property is situated (Figure 3). From the divide, groundwater is shown to flow to the northeast across the Site towards Torrance Creek Swamp at a calculated horizontal hydraulic gradient of 0.04 m/m, which is in general agreement with regional flow patterns presented in Totten Sims Hubicki Associates *et al.* (1998) (Figure 4.4.7, Appendix C). However, groundwater is also shown to flow to the southwest from the divide towards Gordon Street at a calculated horizontal hydraulic gradient of 0.09 m/m and onward towards Hanlon Creek Swamp. These groundwater flow patterns also mimic existing surface water runoff / drainage patterns occurring at the Site as discussed in Stantec (2020).

Horizontal hydraulic conductivity estimates calculated from onsite hydraulic response testing completed at the onsite monitoring wells, which are all screened within sandy silt till, ranged from 5.4×10^{-7} m/s to 1.6×10^{-9} m/s (Table 1; Appendix G). These calculated values are consistent with the literature values of hydraulic conductivity provided for these deposits (Fetter, 1994) and with values provided for the Lower Till Aquitard (Port Stanley Till) as reported in Golder (2011). Overall, the estimated bulk (i.e., geometric mean) horizontal hydraulic conductivity calculated for the overburden deposits is 3.7×10^{-8} m/s (Table 1).

The velocity at which groundwater horizontally flows through the subsurface is calculated through the application of Darcy's law, where:

$$v = \frac{K \nabla}{\theta}$$

where: v = velocity (m/yr)
K = hydraulic conductivity
∇ = hydraulic gradient
θ = effective porosity

Assuming a soil porosity of 0.2 for glacial till (Fetter, 1994), an average horizontal hydraulic gradient of 0.04 m/m for groundwater moving towards the northeast, and geometric mean hydraulic conductivity of 3.7×10^{-8} m/s, the estimated velocity of groundwater flowing through the overburden beneath the Site towards Torrance Creek Swamp is calculated to be approximately 0.23 m/year (i.e., one meter every 4.3 years). Using the same input parameters as above, except for an average horizontal hydraulic gradient of 0.09 m/m, the estimated velocity of groundwater flowing through the overburden beneath the Site towards Gordon Street is calculated to be approximately 0.52 m/year (i.e., one meter every 1.9 years).

The Site is also characterized by downward vertical hydraulic gradients as recorded at MW4-18(S/D) (Figure 9) and MW5-18(S/D) (Figure 10). Vertical hydraulic gradients ranged from -0.5 to -1.0 over the monitoring period, confirming that the Site is a groundwater recharge area.

4.2.2 Groundwater-Surface Water Interaction

Data available on the Grand River Information Network (GRIN) (GRCA, 2019) indicates that downward vertical hydraulic gradients are present beneath the Site and in the surrounding area, with annual recharge rates within the boundaries of the Site ranging from 100 to 200 mm/year (Appendix D). As shown in Figure 10, over the monitoring period (i.e., April 2019 to January 2020) groundwater levels recorded in the multi-level drive-point piezometer (i.e., DP1-19(S/D)) installed within Torrance Creek Swamp approximately 65 m to the northeast of the Site show that the groundwater table occurred at or above ground surface during the spring, declining to depths up to 1.1 m BGS by the late summer to early fall (Table 3; Figure 10). Neutral to upward vertical hydraulic gradients consistently occur beneath this area of the Torrance Creek Swamp, although the vertical gradient did switch to downward over the monitoring period. Overall, vertical hydraulic gradients at DP1-19(S/D) have ranged from -0.06 to 0.17, indicating that this area of the wetland functions as both a groundwater recharge and discharge feature. However, the potential volume of groundwater discharging to the Torrance Creek Swamp during those periods where discharge conditions are present is expected to be minimal, given that groundwater moves at a very slow rate through the overburden deposits (i.e., one meter every 4.3 years).

4.2.3 Infiltration Potential

Estimated infiltration rates for the overburden deposits are provided in Table 4. Infiltration rates were calculated based on an established relationship between vertical hydraulic conductivity and infiltration rate presented in CVC-TRCA (2010), with vertical hydraulic conductivities being estimated based on the results of in-situ hydraulic response testing completed at each monitoring well (Section 3.5). Vertical hydraulic conductivities for the sandy silt till is assumed to be one order of magnitude lower than in-situ measured horizontal hydraulic conductivities, resulting in values ranging from 5.6 x 10^{-8} to 1.6 x 10^{-10} m/s for the till deposits located at depths from 5.0 m to 15.1 m BGS (Table 4). These values are similar to the vertical hydraulic conductivities calculated for the shallower onsite overburden deposits of sand and silt by CMT Engineering (2018) (i.e., 1.5 m to 2.1 m BGS), which were in the range of 10^{-8} m/s. Based on these values, the calculated infiltration rates for the previously mentioned deposits range from 5 mm/hour to 21 mm/hour (Table 4), indicating that the Site is characterized by low infiltration potential.

4.2.4 Groundwater Quality

Groundwater quality results from the sample collected from MW2-18 on September 11, 2018 was assessed against City of Guelph Sanitary and Storm Sewer By-law (1996)-15202 guidelines (i.e., for quality of water potentially discharged to storm or sanitary sewage works during dewatering) (Table 5). Groundwater samples collected from MW4-18(S), MW6-18 and MW7-18, together with the previously mentioned sample results, were also compared against the ODWQS (Table 6). A summary of the results is discussed in the sections below.

4.2.4.1 City of Guelph Sanitary and Sewer By-Law

Results of groundwater quality analysis for the sample collected from MW2-18 (Table 5), which was not field-filtered (i.e., representing the quality of groundwater that would be pumped from an open excavation and discharged to the sewer system without treatment), indicate that this groundwater does not meet the City of Guelph Storm Sewer By-law guidelines due to the following parameter concentrations being exceeded:

- Fecal Coliform (200 MPN/100mL): exceeded the storm sewer limit with a count of 350 MPN/100mL.
- Total Cadmium (0.001 mg/L): exceeded the storm sewer limit with a concentration of 0.0019 mg/L.
- Total Copper (0.01 mg/L): exceeded the storm sewer limit with a concentration of 0.03 mg/L.
- Total Lead (0.05 mg/L): exceeded the storm sewer limit with a concentration of 0.13 mg/L.
- Total Suspended Solids (15 mg/L): exceeded the storm sewer limit with a count of 2,500 mg/L.
- Total Zinc (0.05 mg/L): exceeded the storm sewer limit with a concentration of 0.64 mg/L.

The groundwater also does not meet the City of Guelph Sanitary Sewer By-law guidelines due to the following parameter concentrations being exceeded:

- Total Suspended Solids (350 mg/L): exceeded the sanitary sewer limit with a count of 2,500 mg/L.

Stantec notes that results for the set of groundwater samples that were field-filtered and collected from MW4-18(S), MW6-18 and MW7-18 indicate that if groundwater pumped as part of construction dewatering (if required) is treated for TSS prior to leaving the Site that the removal of the associated sediment-bound metals from the groundwater would result in the remaining dissolved concentrations of cadmium (<0.0001 mg/L), copper (<0.001 mg/L), lead (<0.00056 mg/L), and zinc (<0.005 mg/L) (Table 6) not exceeding the corresponding City of Guelph Storm Sewer By-law concentrations for these parameters.

4.2.4.2 Ontario Drinking Water Quality Standards

Results of the quality testing indicates that the groundwater beneath the Site is classified as calcium-bicarbonate type groundwater (Figure 11), which is typical of shallow fresh groundwater systems in Ontario. The parameters tested in the groundwater samples (i.e., MW4-18(S), MW6-18 and MW7-18) did not exceed any corresponding ODWQS health-related criteria; however, the following tested parameters did exceed their corresponding ODWQS Aesthetic Objectives (non-health related):

- Hardness (100 mg/L): exceeded with concentrations ranging from 320 mg/L to 520 mg/L.
- Total Dissolved Solids (500 mg/L): exceeded at MW4-18(S) (540 mg/L) and MW7-18 (530 mg/L).

In addition, the Medical Officer of Health Reporting Limit (Ontario) of 20 mg/L for sodium was exceeded at MW7-18 (34 mg/L).

5.0 WATER BALANCE

Water balance calculations were completed to quantify infiltration volumes at the Site and confirm the recharge function. A comparison of water balance data under existing (i.e., pre-development) and proposed (i.e., post-development) conditions was completed to determine the potential impacts of development on the Site's recharge function. The methodology for the water balance calculations is provided in Section 5.1. Results of the pre- and post-development water balance analysis are presented in Sections 5.2 and 5.3, respectively.

5.1 METHODOLOGY

Within the hydrologic cycle, the flow of water into and out of system can be described through a simplified water balance equation as follows:

$$P = ET + S + R + I$$ **Equation 1**

Where:

P = precipitation
ET = evapotranspiration
S = change in groundwater storage
R = runoff
I = infiltration (groundwater recharge)

Equation 1 may be further simplified by ignoring the change in groundwater storage (S), which trends over time to zero. The various components of the hydrologic cycle may be estimated through calculations or based on measurements made in the field. Precipitation (P) is typically a measured value. Evapo-transpiration (ET) is calculated based on measured air temperatures. Infiltration (I) and Runoff (R) are calculated based on P and ET, where the difference between P and ET is the water surplus (WS) available for Infiltration (I) and Recharge (R) as follows:

$$WS = P - ET$$ **Equation 2**

Where WS is used to calculate I after applying an infiltration factor (IF),

$$I = WS \times IF$$ **Equation 3**

And R is estimated by subtracting I from WS,

$$R = WS - I$$ **Equation 4**

For this assessment, ET was calculated using the soil moisture balance model by Thornthwaite and Mather (1955). In the Thornthwaite and Mather model monthly potential evapotranspiration (PET) is calculated based on the measured average monthly daily temperature (T_a) and a heat index (H_i) value assuming 12 hours of daylight in a day and 30 days in a month, as follows:

$$PET = 16 \times \left(\frac{10T_a}{H_i}\right)^{\alpha} \qquad \textbf{Equation 5}$$

Where T_a is taken as 0 degrees Celsius for months with negative temperatures, and H_i, the heat index is estimated as,

$$H_i = \sum_{i=1}^{12} \left(\frac{10T_a}{5}\right)^{1.514} \qquad \textbf{Equation 6}$$

For α

$$\alpha = 0.49 + (0.0179 \times H_i) - \left(0.0000771 \times H_i^{\,2}\right) + \left(0.000000675 \times H_i^{\,3}\right) \qquad \textbf{Equation 7}$$

PET values are then multiplied by an adjustment factor, after Thornthwaite and Mather (1957), which represents the average number of daylight hours per month at the latitude of the subject property to give the Adjusted Potential Evapotranspiration (PET_{adj}).

Actual Evapotranspiration (AET) is derived as,

$$AET = PET_{adj} - \Delta S \qquad \textbf{Equation 8}$$

Where ΔS is the change in storage for the month, calculated as,

$$\Delta S = S_{mc} \times e^{\left(\frac{APWL}{S_{mc}}\right)} \qquad \textbf{Equation 9}$$

Where:

S_{mc} = soil moisture capacity

APWL = accumulated potential water loss, calculated for ΔP < 0 as $APWL = -\sum_{i=0}^{12} PET_i$, and for ΔP > 0 by rearranging equation 8; with ΔP= net precipitation = P - PET_{adj}

WS is derived by subtracting AET from the monthly precipitation,

$$WS = P - AET \qquad \textbf{Equation 10}$$

And the infiltration and runoff calculated per Equations 3 and 4 above.

The infiltration factor shown in Equation 3 is estimated based on the topography, soil type and land cover after MOE (2003) and the Ministry of the Environment and Energy (MOEE) (1995). To define appropriate infiltration factors, the Site is divided into three Sub-Areas based on similarities in soil type, topography and vegetation cover as follows:

Sub-Area A	Fine sandy to silt loam, hilly topography, woodland cover
Sub-Area B	Fine sandy to silt loam, hilly topography, pasture and shrubs land cover
Sub-Area C	Fine sandy to silt loam, hilly topography, urban lawn

The delineated Sub-Areas are shown on Figure 15 and the infiltration factors assigned for each Sub-Area under existing conditions (i.e., pre-development) within Catchment 101 (i.e., drainage directed westward towards Upper Hanlon Creek Watershed) and Catchment 102 (i.e., drainage directed eastward towards Torrance Creek subwatershed) is presented in Tables 7 and 8, respectively. As shown in Figure 15, the lands fronting Valley Road within the northeastern portion of the Site are not included in the pre- and post-development water balance calculations, given that these lands are to come under the ownership of the City and, subsequently, will no longer be the responsibility of Tricar.

Soil moisture capacity was set between 75 mm to 300 mm among the Sub-Areas depending on the soil type and land cover as specified under MOE (2003). In Sub-Area A, where the fine sandy to silt loam and woodland cover is present, soil moisture was set at 75 mm. For Sub-Area B, soil moisture content was set at 150 mm corresponding to a fine sandy to silt loam covered with pasture and shrub vegetation. For Sub-Area C, soil moisture content was set at 300 mm corresponding to fine sandy to silt loam having urban lawn type cover associated with the existing onsite residential properties.

For this water balance assessment, climate normals (1981 to 2010) as recorded at the Waterloo Wellington A Climate Station were used to obtain monthly values of precipitation and temperature. The climate data were obtained from Environment Canada (2020) and are summarized in Table 9. The Waterloo Wellington A Climate Station is located approximately 15 km to the southwest of the Site. Although the Guelph Arboretum Climate Station is located approximately 1.5 km to the northwest of the Site, climate normals from 1971 to 2000 are only available from this station.

5.2 PRE-DEVELOPMENT WATER BALANCE

The average annual precipitation at the Site is estimated at 916 mm based on data obtained from the Waterloo Wellington A Climate Station (Environment Canada, 2020). In comparison, Matrix Solutions Inc. (2017) reported average annual precipitation in the Upper Speed Assessment Area is 923 mm/year as measured at the Guelph Arboretum Climate Station. In Sub-Areas A, B, and C, annual actual evapotranspiration is estimated as 563 mm, 554 mm and 541 mm, respectively. This means that 353 mm of surplus water is available for runoff and infiltration across Sub-Area A on an annual basis, with annual surpluses of 362 mm and 375 mm being available across Sub-Areas B and C, respectively. Applying the estimated infiltration factors of 0.55 for Sub-Area A, 0.50 for Sub-Area B and 0.40 for Sub-Area C, the calculated annual infiltration for these sub-areas is 194 mm, 181 mm and 150 mm, respectively.

Based on the previously mentioned water balance components, the average annual volume of infiltration occurring within Catchment 101 (Figure 15) under existing conditions is estimated at 1,977 m^3, equating to a rate of 175 mm/year (Table 7). For Catchment 102 (Figure 15), the annual volume of infiltration is estimated at 3,252 m^3, equating to a rate of 188 mm/year (Table 8). Overall, the annual infiltration rate for the Site is estimated to be 5,229 m^3, equating to a rate of 183 mm/year. This infiltration rate falls within the 100 mm/year to 200 mm/year groundwater recharge rate range modeled for the Site as per the GRIN mapping (Appendix D).

The average annual volume of surface water runoff under existing conditions within Catchment 101 (Figure 15) is 2,120 m^3 (188 mm/year) (Table 7). For Catchment 102 (Figure 15), the annual volume of runoff is estimated at 2,926 m^3 (169 mm/year) (Table 8). Overall, the annual rate of runoff from the Site is estimated to be 5,046 m^3 (176 mm/year).

5.3 POST-DEVELOPMENT WATER BALANCE

Under the post-development condition in the former area of Catchment 101, Stantec has assumed for the water balance calculations that the topography and physical characteristics of the surficial soil deposits (i.e., fine sandy to silt loam) in each of the Sub-Areas will remain relatively unchanged; however, land cover was adjusted to reflect the projected imperviousness cover percentages of the new catchment areas that will occur under proposed conditions (i.e., 201 to 204) (Figure 16). Stantec also assumes that the remaining pervious areas within the new catchment areas will consist of urban lawns and other vegetation associated with urban landscaping. Overall, approximately 88% (0.99 ha) of the former Catchment 101 area (1.13 ha) will be converted to impervious surfaces. Under this scenario, the annual volume of infiltration occurring across the lands located within the former Catchment 101 will decline from 1,977 m^3 to 203 m^3, resulting in an annual infiltration deficit of 1,774 m^3 (Table 10). Annual volumes of surface water runoff from these lands will concurrently increase from 2,120 m^3 to 9,359 m^3, for a runoff increase of 7,239 m^3 (Table 10).

In the former Catchment 102, which will be replaced largely by Catchment 205, the topography, soil deposits (i.e., fine sandy to silt loam), and vegetation cover of these lands will remain mostly unchanged between pre- and post-development conditions. Overall, only 17% (0.29 ha) of the former Catchment 102 area (1.73 ha) will be converted to impervious surfaces. Under this scenario, the annual volume of infiltration occurring across the lands located within the former Catchment 102 will decline from 3,252 m^3 to 2,748 m^3, resulting in an annual infiltration deficit of 504 m^3 (Table 11). Annual volumes of surface water runoff from these lands will concurrently increase from 2,926 m^3 to 5,158 m^3, for a runoff increase of 2,232 m^3 (Table 11).

6.0 GROUNDWATER DEWATERING ASSESSMENT

The following section evaluates the potential onsite needs for construction dewatering and/or the installation of a permanent drainage system, and what mitigation measures could be employed at the Site to minimize any potential disturbances these activities may cause to the form and function of the groundwater system. If dewatering is anticipated, the section will also provide an indication of the quantity and quality of groundwater that will be discharged to the City sewer system. The evaluation is based on information collected from the Site as part of the field investigation together with a review of available background hydrogeological information.

6.1 GROUNDWATER DEWATERING – QUANTITY

6.1.1 Construction Dewatering Volumes

The proposed residential development is to consist of two 12 story apartment buildings having nine townhouse units and 368 apartment units. The development will have a combination of surface parking and two levels of underground parking. The proposed footprint of the underground parking area will cover approximately 11,450 m^2, with the anticipated base of the second level of underground parking being located at an elevation of 335.7 m AMSL. Since seasonally high groundwater depths measured within the proposed underground parking area range from 1.0 m to 4.8 m BGS (334.0 m to 340.3 m AMSL), Stantec anticipates that the excavation for this sturcture will intercept the groundwater table.

Stantec utilized the Dupuit-Forchheimer equation (Powers et al., 2007) to calculate what volume of dewatering could be required to lower the groundwater elevation in the excavation of the underground parking area:

$$Q = \frac{\pi \mathrm{K}(H^2 - {h_w}^2)}{\ln R_o / r_w}$$

where Q = steady state pumping rate (m^3/s)

K = representative hydraulic conductivity (m/s)

H = height of static water level above assigned datum (m)

h_w = depth of dewatering relative to assigned datum (m)

r_w = equivalent radius of dewatering area (m)

R_o = dewatering radius of influence (m)

The input parameters required for this equation were taken from the findings of this hydrogeological investigation, regional geological studies (Golder, 2011), and the layout proposed underground parking area (Figures 1, 12 and 13), such as information pertaining to the projected area of the excavation, horizontal hydraulic conductivity of the subsurface material, the base elevation of the aquifer being pumped, and the targeted groundwater dewatering elevation.

For the excavation, the groundwater dewatering volume potentially required during construction is calculated based on the following assumptions:

- The groundwater table resides within the native diamicton deposits of sand and silt to silty sand / sandy silt till (Port Stanley Till) that underly the Site, which is characterized by horizontal conductivities ranging from 5.4 x 10^{-7} m/s to 1.6 x 10^{-9} m/s. The calculated bulk horizontal hydraulic conductivity for the overburden is 3.7 x 10^{-8} m/s, representing the geometric mean of the above field-tested hydraulic conductivities. For the purposes of the dewatering calculations, Stantec used the bulk horizontal hydraulic conductivity of 3.7 x 10^{-8} m/s.
- The highest groundwater levels measured in the overburden monitoring wells constructed within the proposed footprint of the underground parking area over the monitoring period (i.e., July 2018 to January 2020) ranged from 1.0 m to 4.8 m BGS, corresponding to elevations of 334.0 m to 340.3 m AMSL. A high groundwater elevation of 340.3 m AMSL was assumed to occur over the full area of the proposed underground parking, with this assumption contributing to the overall conservative nature of the analysis.
- The depth of dewatering is set to 1.0 m below the elevation of the second parking level, which will be constructed at an elevation of 335.7 m AMSL (i.e., 335.7 m – 1.0 m = 334.7 m AMSL).
- The base of the groundwater flow system is set to the elevation of the bedrock surface, which is estimated to occur at an elevation of 320 m AMSL.
- The area of the proposed underground parking structure is estimated to be 11,450 m^2.

Based on the above assumptions, the predicted maximum daily volume of groundwater that will be pumped from the subsurface within the footprint of the underground parking area is approximately **37,700 L** (Table H1, Appendix H). Stantec notes that this predicted groundwater volume will likely only be realized during the initial stages of dewatering, with the bulk of this volume representing groundwater that is stored in the overburden deposits. Once this overburden storage is drained and removed from the subsurface, Stantec anticipates that the pumping volumes will lower to reflect a reduced rate of groundwater flowing into the excavation (i.e., normalize to a steady state discharge rate). Stantec notes that these dewatering calculations are estimates and will be subject to adjustments if any changes are made to the input parameters discussed above.

Stantec notes that the predicted dewatering volume does not account for any runoff that may enter the open excavation during construction following a rainfall and/or snowmelt event. Assumming that the excavation required to construct the underground parking garage area is fully open (i.e., 11,450 m^2) during a 25 mm precipitation event, the resulting volume of stormwater accumulating in the excavation together with groundwater inflow volumes could be in the range of **324,000 L.** Under O. Reg. 64/16 and O. Reg. 63/16, a MECP Permit to Take Water (PTTW) is required when construction dewatering rates are anticipated to exceed 400,000 L/day, whereas an Environmental Activity and Sector Registry (EASR) is required when dewatering volumes are expected to range between 50,000 L/day and 400,000 L/day. Consequently, Stantec’s opinion is that Site will require an EASR to complete construction dewatering for the proposed underground parking garage.

Based on the predicted volumes to be pumped from the native diamicton deposits of sand and silt to silty sand / sandy silt till (Port Stanley Till), groundwater dewatering is expected to be handled using conventional pumping methods (i.e., standard sump pumps).

6.1.2 Dewatering Radius of Influence

One of the key issues of concern with the performing of dewatering activities for construction purposes is the potential impact that pumping water from the groundwater system could have on the hydrogeological form and function of nearby natural heritage features, such as the Torrance Creek Swamp.

Based on the above calculations, temporary construction dewatering will likely be required for the short-term cut and cover works associated with the building construction. The effects of local dewatering in general cannot be mitigated, since dewatering deliberately seeks to create an effect (i.e., temporary lowering of groundwater levels); however, the amount of drawdown to occur as a result of the construction activities is expected to remain within a relatively small distance around the excavations due to the low permeability of the surrounding deposits. The lateral extent of groundwater level drawdown from the excavation areas is calculated using the Sichart and Kryieleis method (Powers et al., 2007):

$$R_o = r_w + 3000(H - h_w)\sqrt{K}$$

where R_o = dewatering radius of influence (m)
K = representative hydraulic conductivity (m/s)
H = height of static water level above assigned datum (m)
h_w = depth of dewatering relative to assigned datum (m)
r_w = equivalent radius of dewatering area from center of the excavation (m)

According to the calculation, the predicted dewatering radius of influence from the proposed development is approximately 64 m from the center of the excavation (Table H1, Appendix H). Overall, the radius of influence from short-term construction dewatering is expected to remain close to the excavation edges and not extend into nearby natural heritage features (Figure 17).

6.1.3 Long-term Drainage

The proposed foundation of the underground parking area will be constructed with a waterproof base and, as such, no permanent drainage system / dewatering is planned for this structure.

6.2 GROUNDWATER DEWATERING – QUALITY

6.2.1 Discharging to Storm Sewer

As discussed in Section 4.2.4, groundwater quality results for the sample collected from MW2-18 (Table 5) indicate that any potential dewatering volumes cannot be discharged to the City storm sewer system as the following parameters exceed the City of Guelph Sanitary and Storm Sewer By-law (1996)-15202 limits due to concentrations exceeding the following parameters:

- Fecal Coliform (200 MPN/100mL): exceeded the storm sewer limit with a count of 350 MPN/100mL.
- Total Cadmium (0.001 mg/L): exceeded the storm sewer limit with a concentration of 0.0019 mg/L.
- Total Copper (0.01 mg/L): exceeded the storm sewer limit with a concentration of 0.03 mg/L.
- Total Lead (0.05 mg/L): exceeded the storm sewer limit with a concentration of 0.13 mg/L.
- Total Suspended Solids (15 mg/L): exceeded the storm sewer limit with a count of 2,500 mg/L.
- Total Zinc (0.05 mg/L): exceeded the storm sewer limit with a concentration of 0.64 mg/L.

6.2.2 Discharging to Sanitary Sewer

Groundwater at the Site does largely satisfy the bylaw limits to permit discharging to the City sanitary sewer system, except for TSS:

- Total Suspended Solids (350 mg/L): exceeded the sanitary sewer limit with a count of 2,500 mg/L.

However, if groundwater is treated for TSS (e.g., filtration or sedimentation measures) prior to leaving the Site, the concentration for this parameter can be reduced to levels that would allow for this groundwater to be discharged to the sanitary sewer system.

Prior to discharging groundwater pumped from the excavation (during construction dewatering) to the sanitary sewer, the Contractor retained to complete the dewatering will be expected to implement measures to reduce TSS in the discharge water to below the corresponding concentrations mentioned above.

The Contractor should consult with the City to confirm whether there are preferred methods and/or policies for reducing TSS concentrations in discharge water (including monitoring requirements). In Stantec’s experience, common mitigation measures utilized to reduce TSS concentrations in discharge water can include:

- wrapping of the inlet pump head (i.e., sump/trash pumps) with filter fabric and surrounding the inlet with clear stone, or equivalent
- passing discharge water through geotextile filter bags or straw bale/filter fabric device
- directing discharge through a tank, allowing time for the suspended solids to settle out prior to being released to the sewer.

In addition, the Contractor’s responsibilities will often include:

- obtaining a sewer use permit prior to discharging to the sanitary sewer
- ensuring that the quality of the pumped groundwater meets required By-law limits
- complete any additional groundwater quality testing as required by the City of Guelph.

7.0 IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 GROUNDWATER RECHARGE

As per the proposed Site Plan (Figure 1), development is to include the construction of two 12 story apartment buildings having nine townhouse units, internal roadways, surface parking, and two levels of underground parking. In the areas of the Site where this development is to occur, there will also be the introduction of impervious surfaces (e.g., rooftops, concrete/asphalt roadways, and walkways) and, subsequently, a corresponding reduction in the volume of water infiltrating to the subsurface. The potential impacts associated with the introduction of impervious surfaces on the recharge function of the Site are discussed below.

Under the post-development condition, impervious surfaces in the former Catchment 101 are expected to cover approximately 88% of this catchment (0.99 ha of 1.13 ha), resulting in a projected infiltration volume deficit of 1,774 m^3/year (i.e., from 1,977 m^3/year to 203 m^3/year) (Table 10). For the former Catchment 102, impervious surfaces will cover approximately 17% of this catchment under the post-development condition (0.29 ha of 1.73 ha), resulting in a projected infiltration volume deficit of 504 m^3/year (i.e., from 3,252 m^3/year to 2,748 m^3/year) (Table 10). Overall, the total volume of infiltration at the Site will be reduced from 5,229 m^3/year to 2,951 m^3/year (infiltration deficit of 2,278 m^3/year) from the pre- to post-development condition.

Low impact development (LID) is a stormwater management strategy that seeks to mitigate the impacts of increased stormwater runoff by managing this runoff as close to source as possible, with the implementation of such strategies also providing the residual benefit of offsetting potential infiltration losses associated with the increase in impervious surfaces associated with a given development. Infiltration augmentation options (as described in CVC-TRCA Low Impact Development Stormwater Management Planning and Design Guide, 2010) that could potentially be available for use across the Site to assist in maximizing infiltration under the post-development condition include:

- roof downspout disconnection
- soakaways / infiltration trenches
- bioretention cells
- vegetated filter strips
- grass swales or enhanced grassed swales

As discussed in the Stormwater Management Brief, which is provided in the Functional Servicing Report (Stantec, 2020), the post-development LID infiltration strategy proposed for the Site will involve the construction of an onsite infiltration (rock) trench in Catchment 205 (Figure 16). This trench will be sized to infiltrate a 25 mm storm event captured by Catchments 202, 203, and 204 (4,400 m^2 in roof-top controlled area and 8,500 m^2 in parking lot area), resulting in an infiltration volume of 323 m^3 for each such storm event. As per historical climate records (Table 9), on average there are approximately five days a year where storm events total 25 mm, equating to a total volume of 1,615 m^3 that will be directed to the infiltration gallery and, subsequently, mitigate roughly 78% of the projected annual infiltration deficit. Given that there are on average a total of 84 days where precipitation totals will range from 5 mm up to 25 mm, it is reasonable to conclude that the proposed LID strategy (i.e., rock trench) will more than mitigate the remaining annual infiltration deficit for the Site.

7.2 GROUNDWATER DEWATERING

One of the key issues of concern with the performing of dewatering activities for construction purposes is the potential impact that pumping water from the groundwater system could have on nearby natural heritage features.

The effects of local dewatering in general cannot be mitigated, since dewatering deliberately seeks to create an effect (i.e., temporary lowering of groundwater levels); however, the amount of drawdown expected to occur due to construction activities is expected to remain within a small distance around the development excavation. According to the dewatering calculations, the predicted maximum horizontal distance that the pumping zone of influence will extend outward from the active zone of dewatering is estimated at 64 m. As shown in Figure 17, this predicted dewatering radius of influence will not intercept the Torrance Creek Swamp to the northeast or Hanlon Creek Swamp to the southwest of the Site. Stantec notes that the residual effects of short-term construction dewatering are reversible seeing that once pumping ceases, groundwater levels will recover and re-equilibrate to the local groundwater table.

Since the proposed underground parking area will be constructed with a waterproof base, no permanent drainage system / dewatering is planned for this structure. As such, there will be no long-term effects of permanent dewatering associated with this development.

7.3 SOURCE WATER PROTECTION

A drinking-water threat is an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water. The following activities are prescribed by the province of Ontario under O. Reg. 287/07 to be drinking water threats (i.e., Significant Drinking Water Threat Policy Categories):

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the *Environmental Protection Act*.
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
3. The application of agricultural source material to land.
4. The storage of agricultural source material.

5. The management of agricultural source material.
6. The application of non-agricultural source material to land.
7. The handling and storage of non-agricultural source material.
8. The application of commercial fertilizer to land.
9. The handling and storage of commercial fertilizer.
10. The application of pesticide to land.
11. The handling and storage of pesticide.
12. The application of road salt.
13. The handling and storage of road salt.
14. The storage of snow.
15. The handling and storage of fuel.
16. The handling and storage of a dense non-aqueous phase liquid (DNAPL).
17. The handling and storage of an organic solvent.
18. The management of runoff that contains chemicals used in the de-icing of aircraft.
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.
20. An activity that reduces the recharge of an aquifer.
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.

The Site is intercepted by the Burke Well WHPA-B and -C, noting that the footprint for the proposed development is confined to the WHPA-C. The WHPA-C has an assigned vulnerability score ranging from four (4) to six (6) (Figure 6), indicating that the threat of an activity or condition occurring at ground surface within this area, and subsequently adversely affecting the quality and/or quantity of the aquifer system in which the Burke Well draws its groundwater supply, is low to medium, respectively.

As per the Source Protection Plan (SPP) (LERSPC, 2015b), the Site is only subject to the protection policies specified under Significant Drinking Water Threat Policy Category 16 (DNAPLs). Since the planned use for the Site does not involve the onsite handling and storage of a DNAPL, the policies under Category 16 does not apply.

No protection policies are specified in the SPP (LERSPC, 2015b) that apply to the Site's designation as a SGRA or WHPA-E (intercepts the northeast portion of the property).

7.4 SPILL CONTAINMENT AND RESPONSE

The potential exists for spills during any construction activity, with the most probable type of spill occurring being attributable to the refuelling of construction equipment that cannot readily leave the Site (e.g., earth movers). The potential impacts of a spill could be the contamination of soils, groundwater and/or surface water. By implementing proper protocols for the handling of fuels and lubricants during construction, the risk of a spill occurring will be greatly reduced. The procedures to be implemented to prevent onsite spills are as follows:

- all trucks or other road vehicles would be refuelled and maintained offsite, where practicable
- refuelling and lubrication of other construction equipment would not be allowed within 30 m of a drainage system or dewatering excavation
- regular inspections of hydraulic and fuel systems on machinery, with leaks being repaired immediately upon detection or the equipment being removed from Site
- spill kits containing absorbent materials would be kept on hand
- implement best management practices and develop an emergency spill response plan

Given that anticipated construction activities at the Site are not expected to involve the storage or use of bulk chemicals or fuels, any potential spill that does occur would be localized and involve a small volume of material. Standard containment facilities and emergency response materials are to be maintained onsite as required, with refuelling, equipment maintenance, and other potentially contaminating activities being confined to designated areas. As appropriate, spills are to be reported immediately to the MECP Spills Action Centre.

8.0 CONCLUSIONS

Based on the hydrogeological assessment, using the existing data collected at the Site and information obtained from a background review of regional data, the following conclusions are provided:

1. Subsurface conditions across the Site consist of silty sand to sandy silt till (Port Stanley Till), which predominantly forms a horizontally and vertically contiguous unit beneath the Site, with this unit being overlain by a 2.3 to 4.8 m thick diamicton deposit consisting of very loose to dense sand and silt, with some gravel and trace clay. The Port Stanley Till occurs at elevations ranging from 341.6 to 334.7 m AMSL beneath the Site, with this unit extending to the termination depth of the onsite boreholes (333.4 to 324.6 m AMSL). Locally, the bedrock surface is reported to occur at an elevation of approximately 320 m AMSL and does not factor into the construction of the proposed development.

2. Groundwater depths across the Site range from 1.0 m to 9.2 m BGS over the monitoring period (July 2018 to January 2020), fluctuating between elevations of 332.6 m to 340.7 m AMSL. Overall, the highest groundwater table occurred in the spring, declining by up to 5.6 m to its lowest elevation by late fall.

3. Groundwater contours mimic the prevailing topography of the Site, with a localized groundwater divide running along the northeast-southwest axis of the drumlin upon which the property is situated (Figure 14). Groundwater flows from the divide to the northeast and southwest towards Torrance Creek Swamp and Gordon Street, respectively.

4. The estimated velocity of groundwater flowing through the overburden beneath the Site towards Torrance Creek Swamp is calculated to be approximately 0.23 m/year (i.e., one meter every 4.3 years). Groundwater flow towards Gordon Street is estimated to move at a velocity of approximately 0.52 m/year (i.e., one meter every 1.9 years).

5. Neutral to upward vertical hydraulic gradients consistently occur beneath the area of the Torrance Creek Swamp that is located approximately 65 m to the northeast of the Site, although noting that the vertical hydraulic gradient is observed to switch downward over the year. Overall, vertical hydraulic gradients beneath this wetland ranged from -0.06 to 0.17, indicating that the wetland functions as both a groundwater recharge and discharge feature. However, the potential volume of groundwater discharging to the Torrance Creek Swamp during those periods where discharge conditions are present is expected to be minimal, given that groundwater moves at a very slow rate through the overburden deposits (i.e., one meter every 4.3 years).

6. Vertical hydraulic conductivities for the sandy silt till range from 5.6×10^{-8} to 1.6×10^{-10} m/s at depths ranging from 5.0 m to 15.1 m BGS throughout the Site. These hydraulic conductivities equate to infiltration rates of 5 mm to 21 mm/hour, indicating that the Site is characterized by low infiltration potential.

7. Groundwater beneath the Site is classified as calcium-bicarbonate type water. No tested parameters having health-related ODWQS were detected above their applicable standards. The ODWQS for hardness was exceeded in samples collected at all wells. The presence of elevated hardness concentrations is typical of groundwater in southern Ontario.

8. The proposed development footprint for the Site is located within the WHPA-C for the Burke Municipal Well. Subsequently, as per the Source Protection Plan, the Site is only subject to the protection policies specified under Significant Drinking Water Threat Policy Category 16 (DNAPLs). Since the planned use for the Site does not involve the onsite handling and storage of a DNAPL, the policies under Category 16 do not apply to the development.

9. Water balance calculations indicate that the annual pre-development infiltration volume occurring at the Site will be reduced from 5,229 m^3 to a post-development infiltration volume of 2,951 m^3, resulting in an annual infiltration deficit of approximately 2,278 m^3. The post-development LID infiltration strategy proposed for the Site will involve the construction of an onsite infiltration (rock) trench that will be sized to infiltrate 25 mm storm events captured from the impervious areas of the Site (e.g., rooftops, concrete/asphalt roadways, and walkways), resulting in an infiltration volume of 323 m^3 for each such storm event. As per historical climate records, on average there are approximately five days a year where storm events total 25 mm, equating to a total volume of 1,615 m^3 that will be directed to the infiltration gallery and, subsequently, mitigate roughly 78% of the projected annual infiltration deficit. Given that there are on average a total of 84 days where precipitation totals will range from 5 mm up to 25 mm, it is reasonable to conclude that the proposed LID strategy (i.e., rock trench) will more than mitigate the remaining annual infiltration deficit for the Site.

10. The steady-state groundwater pumping rate for construction dewatering activities is predicted to be 37,700 L/day. Higher dewatering rates could be realized at the start of construction and during storm / snowmelt events. A design dewatering rate of 324,000 L/day reflects a factor of safety to provide an adequate dewatering volume to account for wet weather events. Consequently, an MECP EASR will be required to complete construction dewatering activities, given that pumped volumes will exceed 50,000 L/day and remain below 400,000 L/day. Based on the volumes predicted and the type of material (dense till), groundwater dewatering is expected to be handled using conventional pumping methods (i.e., standard sump pumps).

11. The proposed underground parking area associated with the development will be constructed with a waterproof base and, as such, no permanent drainage system / dewatering is planned for this structure.

12. According to the dewatering calculations, the predicted maximum horizontal distance that the pumping zone of influence will extend is 64 m outward from the active zone of dewatering (Figure 17). This predicted dewatering radius of influence will not intercept the Torrance Creek Swamp to the northeast or Hanlon Creek Swamp to the southwest of the Site and, consequently, not interfere with the hydrogeological function of these wetlands.

9.0 REFERENCES

American Society for Testing and Materials International. 2009. ASTM-D2488-09a. Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

AquaResource Inc. 2009. Tier 2 Water Quantity Stress Assessment Report, Grand River Watershed. Report prepared for the Grand River Conservation Authority. Breslau, Ontario. December 2009.

Brunton, F.R., 2008. Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p. 31-1 to 31-18. Bouwer, H., 1989. The Bouwer and Rice slug test--an update, Ground Water 27 (3): 304-309.

Bouwer, H., and Rice, R.C., 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research* 12 (3): 423-428.

Chapman, L.J. and D.F. Putnum, 1984. The Physiography of Southern Ontario: Third Edition. Ontario Geological Survey, Special Volume 2.

City of Guelph. 2018. Letter Re: 1242, 1250 and 1260 Gordon Street and 9 Valley Road Environmental Impact Study Terms of Reference. October 17, 2018.

Credit Valley Conservation - Toronto and Region Conservation Authority (CVC-TRCA), 2010. Low Impact Development Stormwater Management Planning and Design Guide – Version 1.0.

Duffield, G.M., 2014. AQTESOLV^{TM} for Windows, Version 4.5 Professional. HydroSOLVE Inc., Reston, VA.

Environment Canada, 2020. Canadian Climate Normals 1981-2010, Waterloo Wellington A Climate Station, Climate ID 6149387. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed April 2020.

Fetter, C.W. 1994. Applied Hydrogeology, Third Edition. Prentice-Hall, New Jersey.

Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Prentice Hall, New Jersey, 604 p.

Gamsby and Mannerow Ltd. 1993. A Watershed Management Strategy for the Upper Hanlon Creek and its Tributaries. June 1993.

Golder Associates Ltd. 2011. City of Guelph Tier Three Water Budget and Local Area Risk Assessment. Appendix A: Characterization Final Report.

Grand River Conservation Authority. 2019. Mapping produced using information from the Grand River Information Network (GRIN), https://www.grandriver.ca/en/our-watershed/Maps-and-data.aspx.

Jagger Hims Limited. 1998. Volume 1 – Aquifer Performance Evaluation, Southwest Quadrant, City of Guelph. Prepared for The Corporation of the City of Guelph, November 1998.

Karrow, P.F. 1968. Pleistocene Geology of the Guelph Area, Southern Ontario; Ontario Department of Mines Report No.61 with map No. 2153.

Lake Erie Region Source Protection Committee (LERSPC). 2015a. Approved Assessment Report for the Grand River Source Protection Area within the Lake Erie Source Protection Region. November 25, 2015.

Lake Erie Region Source Protection Committee (LERSPC). 2015b. Grand River Source Protection Area, Approved Source Protection Plan – Volumes I & II. November 26, 2015.

Matrix Solutions Inc. 2017. City of Guelph and Township of Guelph/Eramosa Tier Three Water Budget and Local Area Risk Assessment. Prepared for Lake Erie Source Protection Region. March 2017.

Ministry of the Environment, Conservation and Parks (MECP). 2020. Source Water Protection Information Atlas. Accessed March 2020. https://www.gisapplication.lrc.gov.on.ca/SourceWaterProtection/Index.html?viewer=SourceWaterProtection.SWPViewer&locale=en-US

Ministry of the Environment (MOE). 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. Original publication June, 2003, revised June 2006 in support of O. Reg. 169/03 (January 1, 2018).

Ministry of the Environment (MOE). 2003. Stormwater Management Planning and Design Manual. March, 2003.

Ministry of the Environment (MOE). 1990. Wells. Regulation under the Ontario Water Resources Act. Regulation 903 of the Revised Regulations of Ontario, 1990.

Ministry of Environment and Energy. 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

Ontario Geological Survey (OGS), 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release -- Data 128-REV, ISBN 978-1-4435-2483-4.

Powers, J.P., A.B. Corwin, P.C. Schmall, and W.E. Kaeck, 2007. Construction Dewatering and Groundwater Control, New Methods and Applications. John Wiley & Sons, Inc., 3rd Edition.

Stantec Consulting Limited (Stantec). 2020. Functional Servicing Report for Gordon Street – Guelph, ON. April 2020.

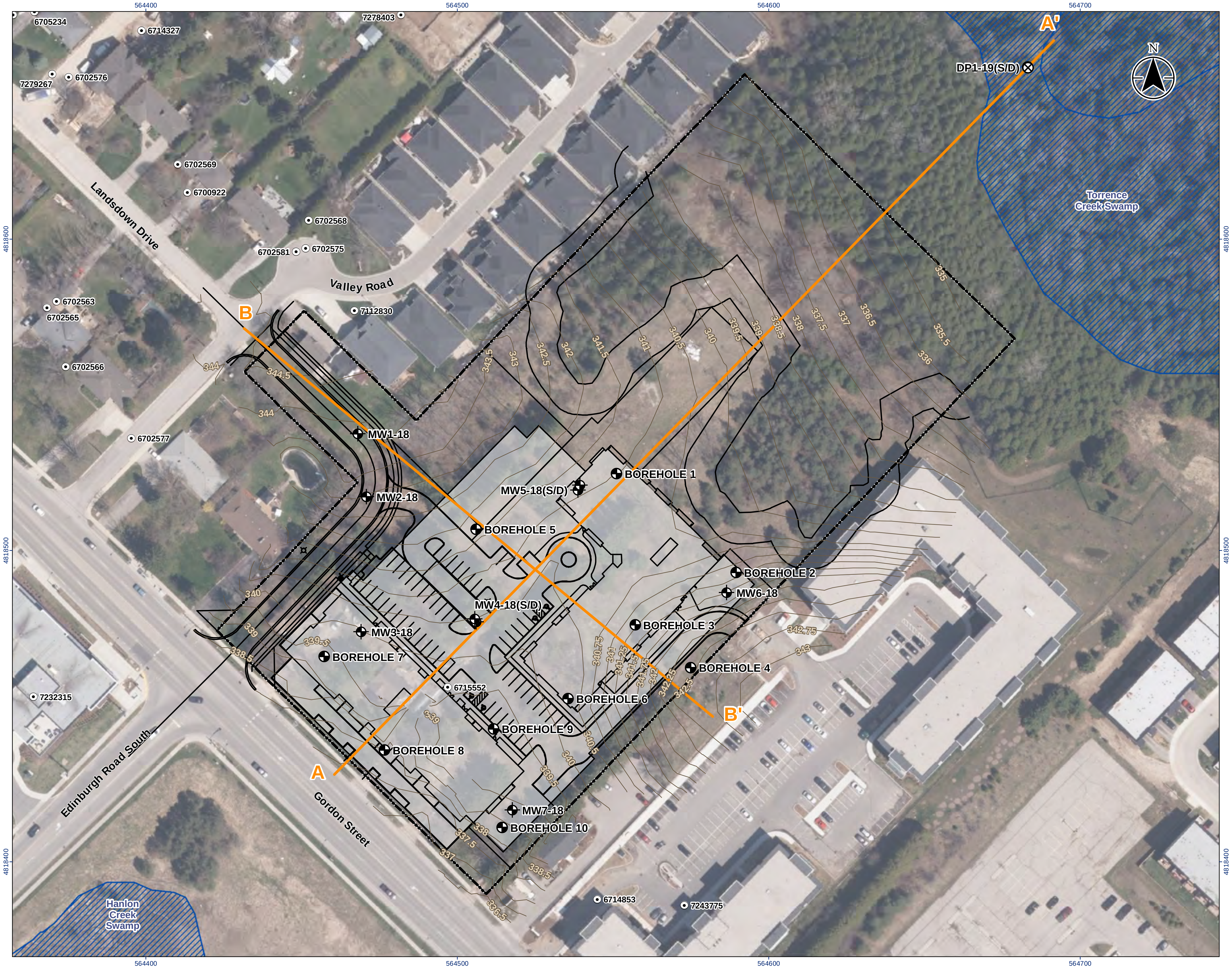
Thornthwaite, C.W. and Mather, J.W. 1955. The water balance. Philadelphia, PA: Drexel Institute of Technology, Climatological Laboratory Publication No.8.

Thornthwaite, C.W., and Mather J.W., 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

Todd, D.K. 1980. Groundwater Hydrology, 2nd Edition. Wiley, New York, 552 p.

Totten Sims Hubicki Associates, Ecological Services Group, Ray Blackport, Mark L. Dorfman Planner Inc., Shroeter & Associates, and Donald G. Weatherbe Associates. 1998. Torrance Creek Subwatershed Study - Management Study. Prepared for City of Guelph and Grand River Conservation Authority, September 1998, September 1998, Revised November 1998.

APPENDIX A:
FIGURES



Stantec

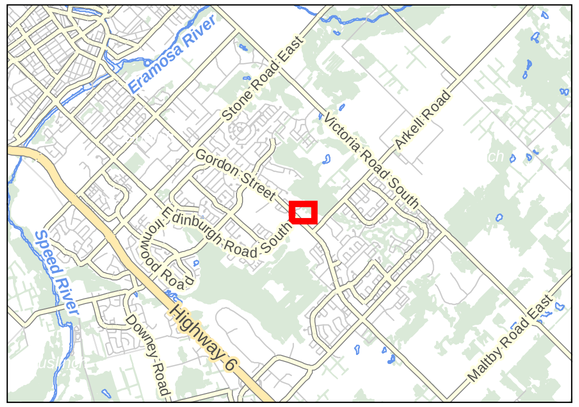
Legend

- ⬚ Site Boundary
- Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ● Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- Cross-Section Location
- Proposed Development Plan
- Topographic Contour (m AMSL)
- ▭ Proposed Extent of Underground Parking
- ▨ Wetland - Evaluated (Provincial)

0 25 50 Metres

1:1,250 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



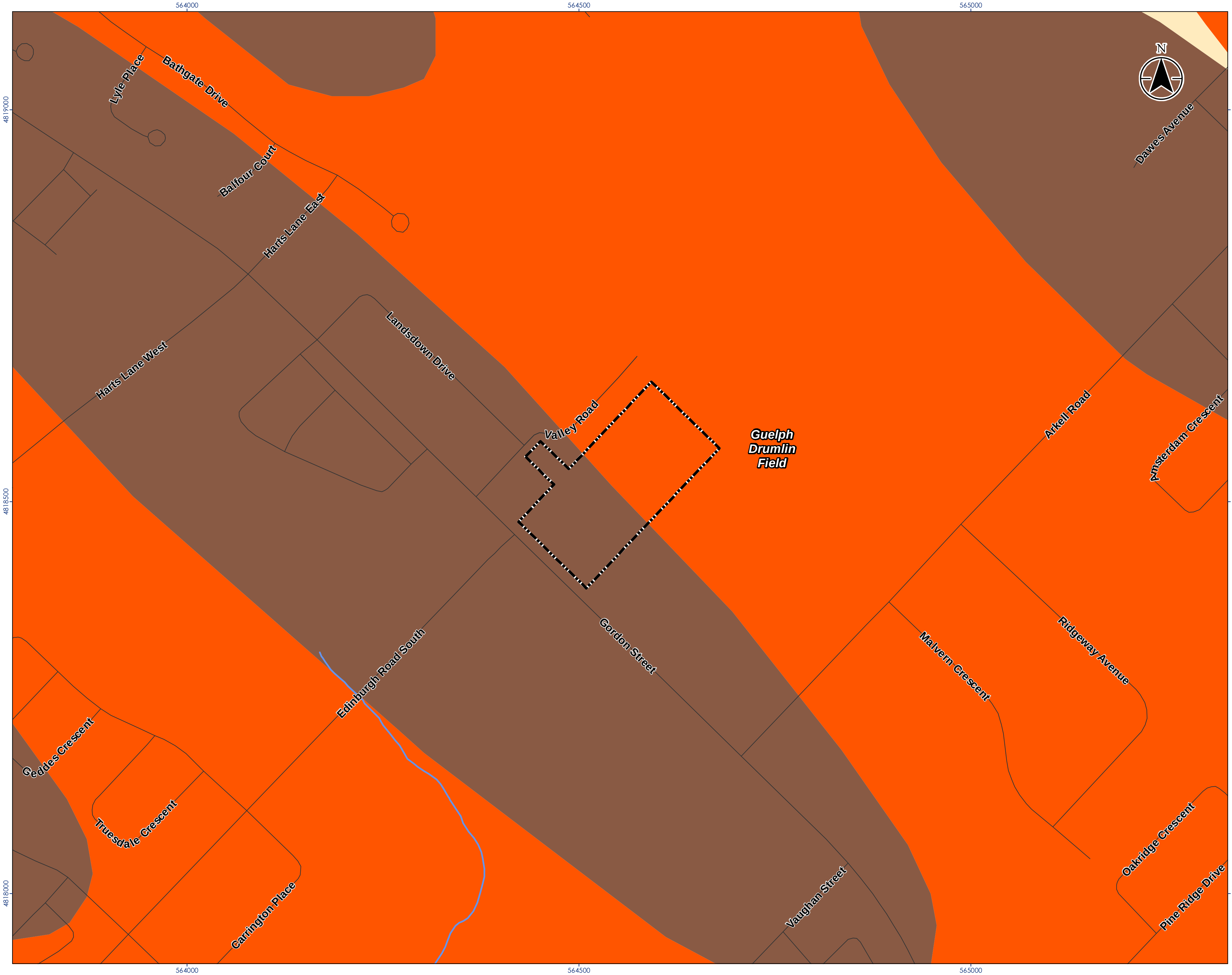
Project Location City of Guelph	161413684 Prepared by CMC on 2020-04-08

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
1

Title
Site Location

\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig01_SitePlan.mxd Revised: 2020-04-08 By: ccoghlan



Stantec

Legend

- ⬚ Site Boundary
- — Watercourse (Permanent)
- ⬚ Physiographic Region Boundary

Physiography

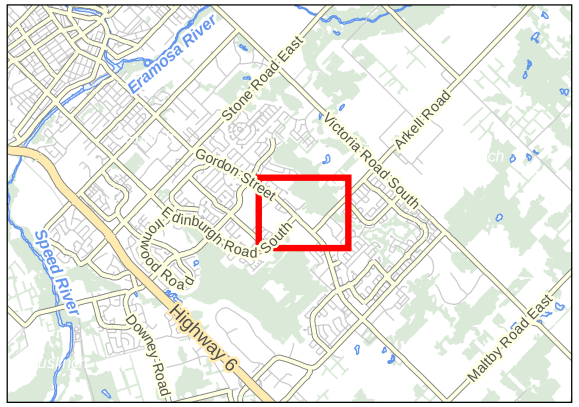
- 🟫 7: Drumlins
- 🟨 6: Till Plains (Drumlinized)
- 🟧 3: Spillways

0 125 250 Metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



Project Location
City of Guelph

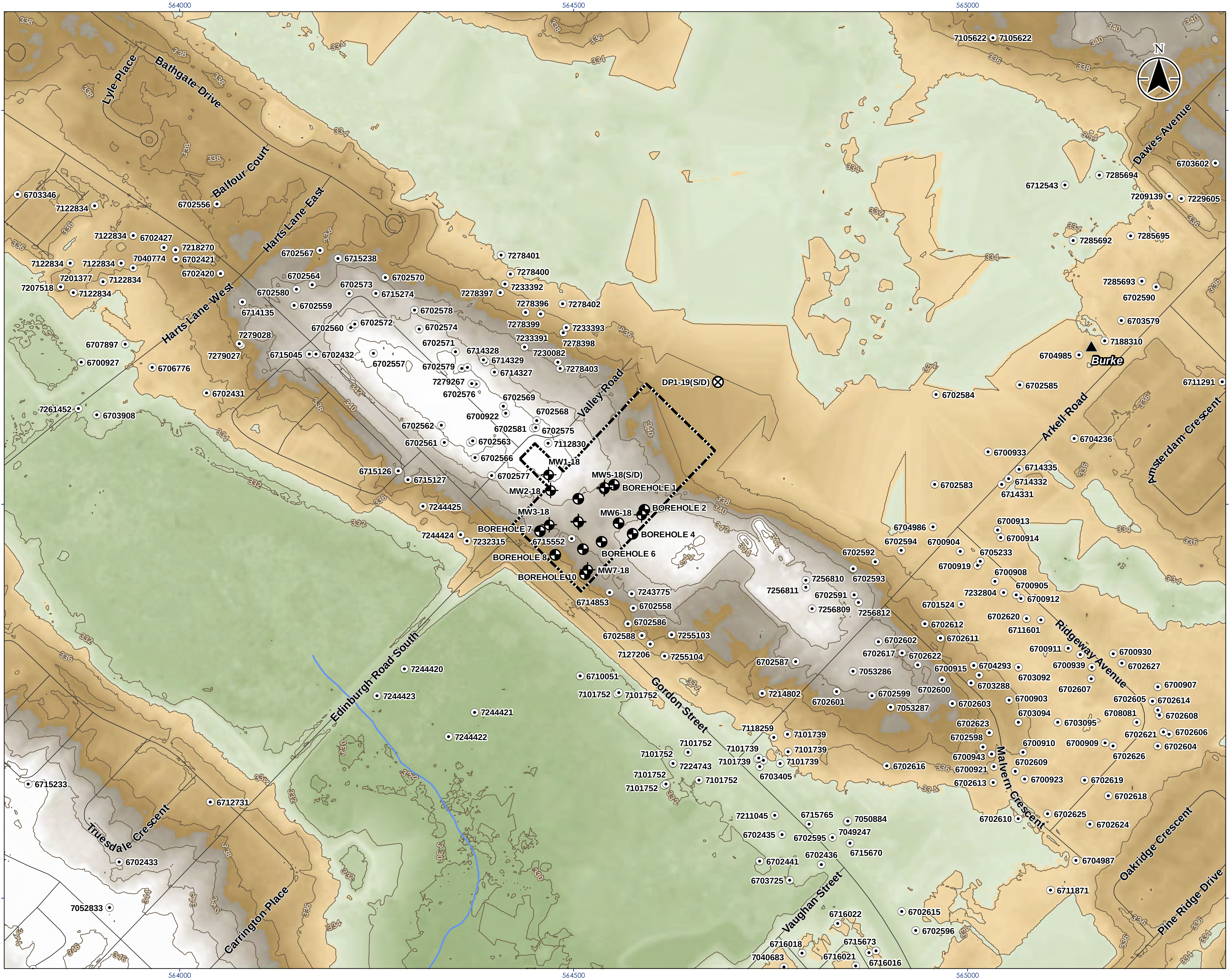
161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
2

Title
Physiography

\\cd1220-f02\Work_group\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig02_Physiography.mxd Revised: 2020-03-24 By: ccoghlan



Stantec

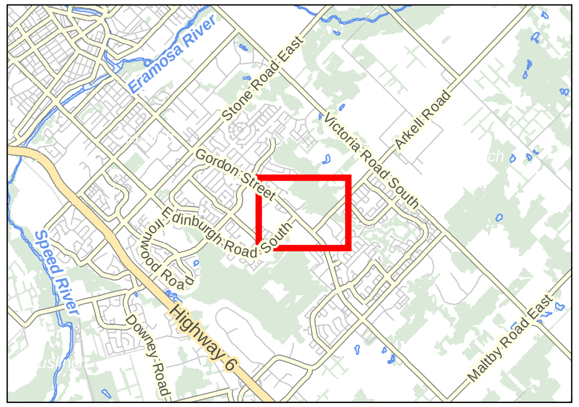
Legend
- ⬚ Site Boundary
- ▲ Production Well
- ⊕ Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ◕ Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- — Watercourse (Permanent)
- — Topographic Contour (m AMSL)

Ground Surface Elevation (m AMSL)
High : 348.52
Low : 328.91

0 125 250
Metres

1:5,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2019.
3. Topography derived from the Southwestern Ontario Orthophotography Project (2015) © Queen's Printer for Ontario, 2019.



Project Location
City of Guelph

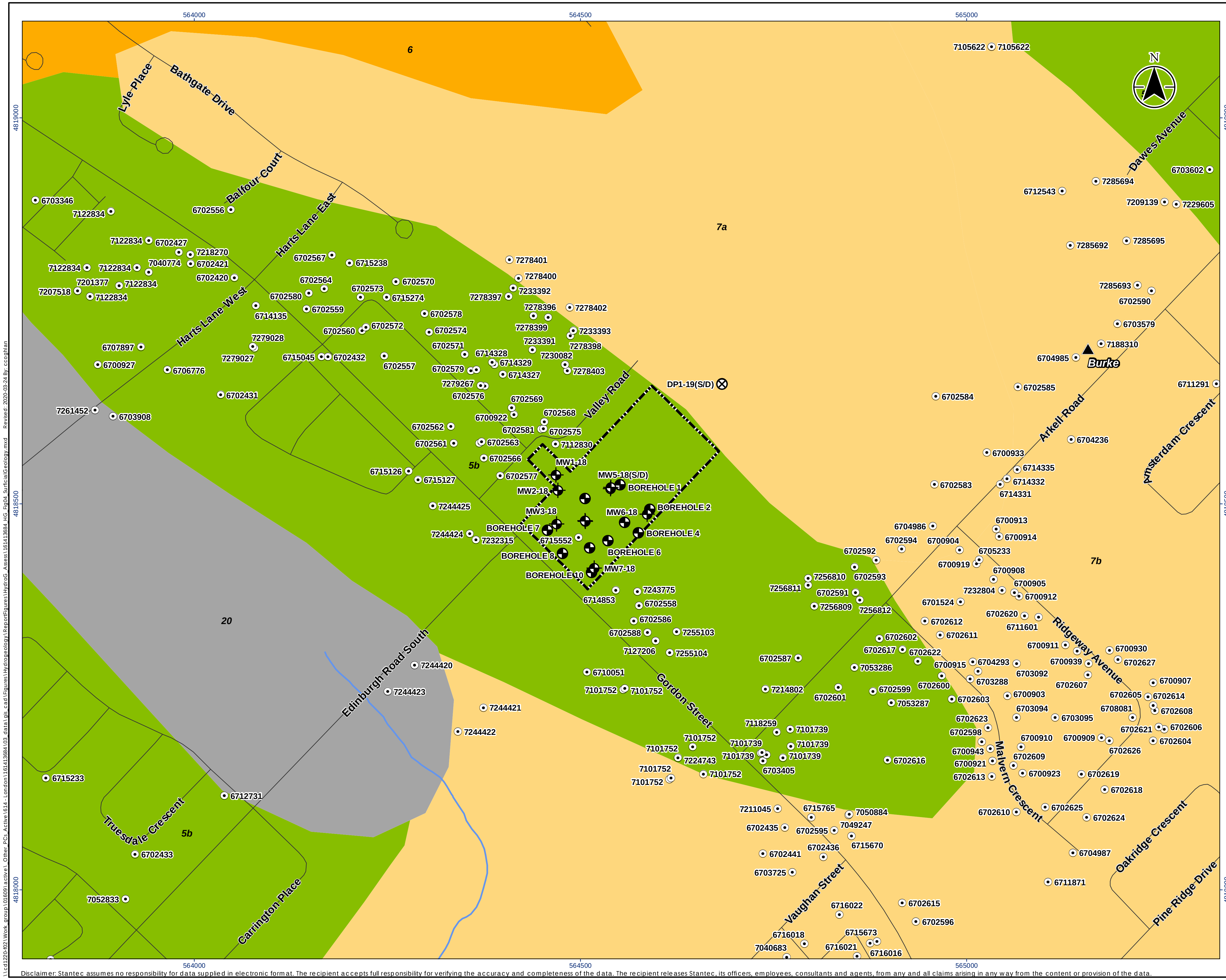
161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
3

Title
Topography

\\cd1220-f02\Work_group\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig03_Topography.mxd Revised: 2020-03-24 By: ccoghlan



Stantec

Legend

- ⬚ Site Boundary
- ▲ Production Well
- ⌖ Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ◕ Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- — Watercourse (Permanent)

Surficial Geology

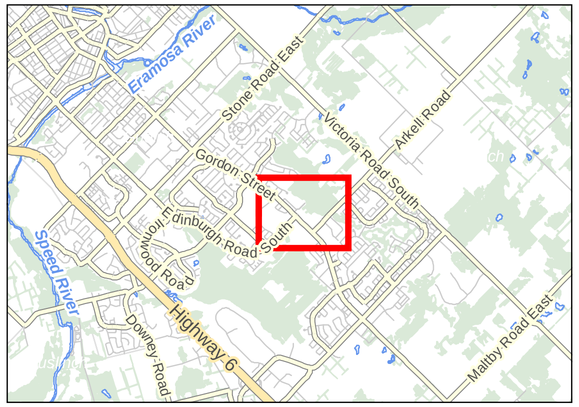
- ▨ 20: Organic deposits
- 🟨 7a: Glaciofluvial deposits (Sandy deposits)
- 🟨 7b: Glaciofluvial deposits (Gravelly deposits)
- 🟧 6: Ice-contact stratified deposits
- 🟩 5b: Stone-poor, carbonate-derived silty to sandy till

0 125 250 Metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Ontario Geological Survey 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV ISBN 978-1-4435-2483-4



Project Location
City of Guelph

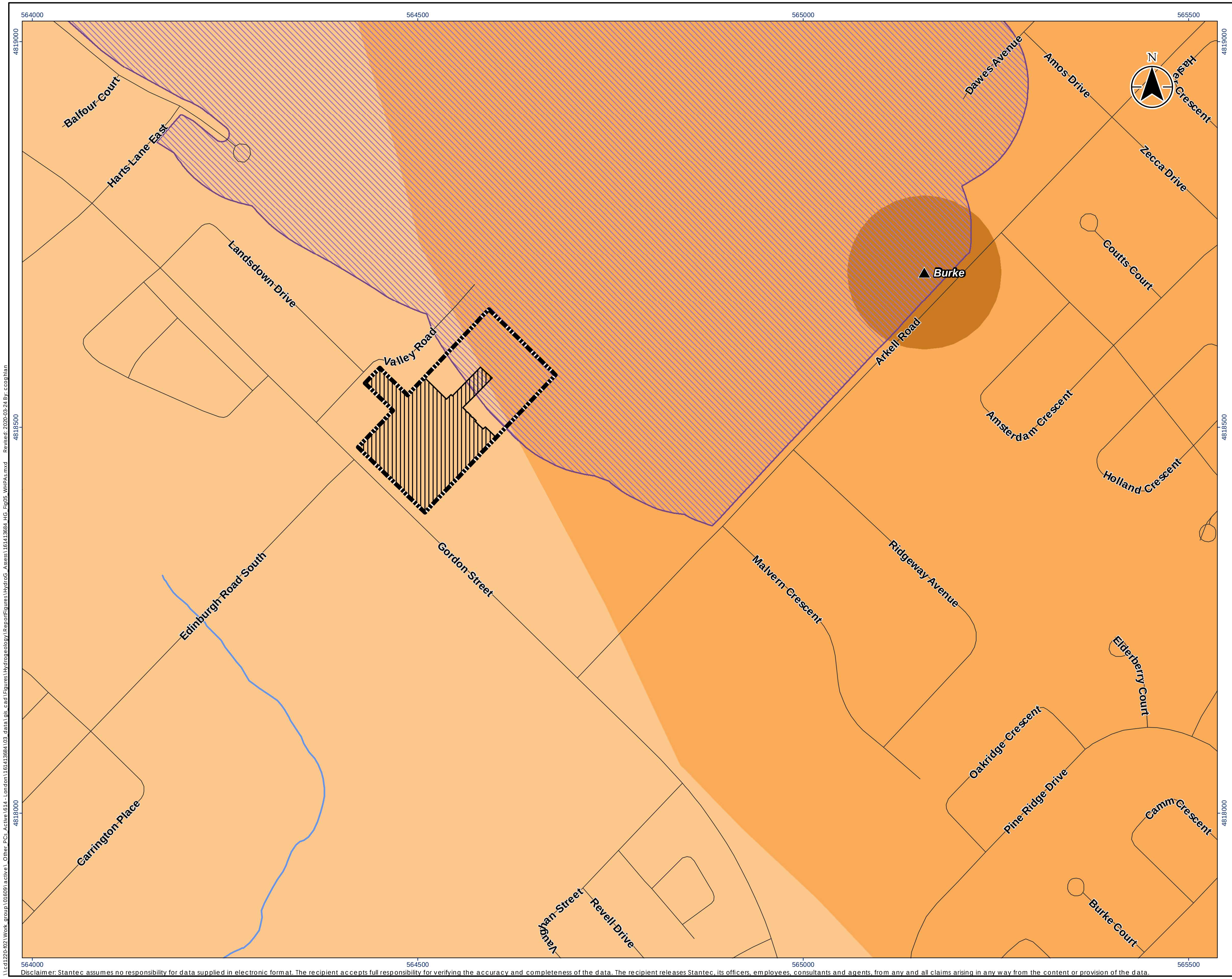
161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
4

Title
Surficial Geology

\\cd1220-f02\Work group\01609\active\ Other PCs Active\614 - London\161413684\03 data\gis cad\Figures\Hydrogeology\ReportFigures\HydroG Assess\161413684 HG Fig04 SurficialGeology.mxd Revised: 2020-03-24 By: ccoghlan



\\cd1220-f02\Work_group\01609\active\Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\Report\Figures\HydroG_Assess\161413684_HG_Fig05_WHPAs.mxd Revised: 2020-03-24 By: ccoghlan

Stantec

Legend

- ▨ Site Boundary
- ▥ Proposed Development Footprint
- — Watercourse (Permanent)

Wellhead Protection Areas

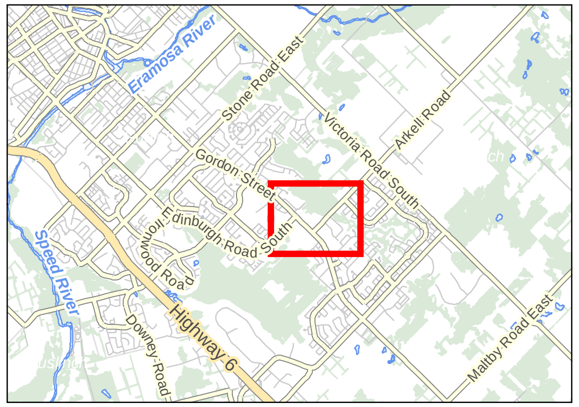
- 🟫 WHPA-A
- 🟧 WHPA-B
- 🟨 WHPA-C
- ▨ WHPA-E

0 125 250 Metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Wellhead protection areas © Grand River Conservation, 2018.



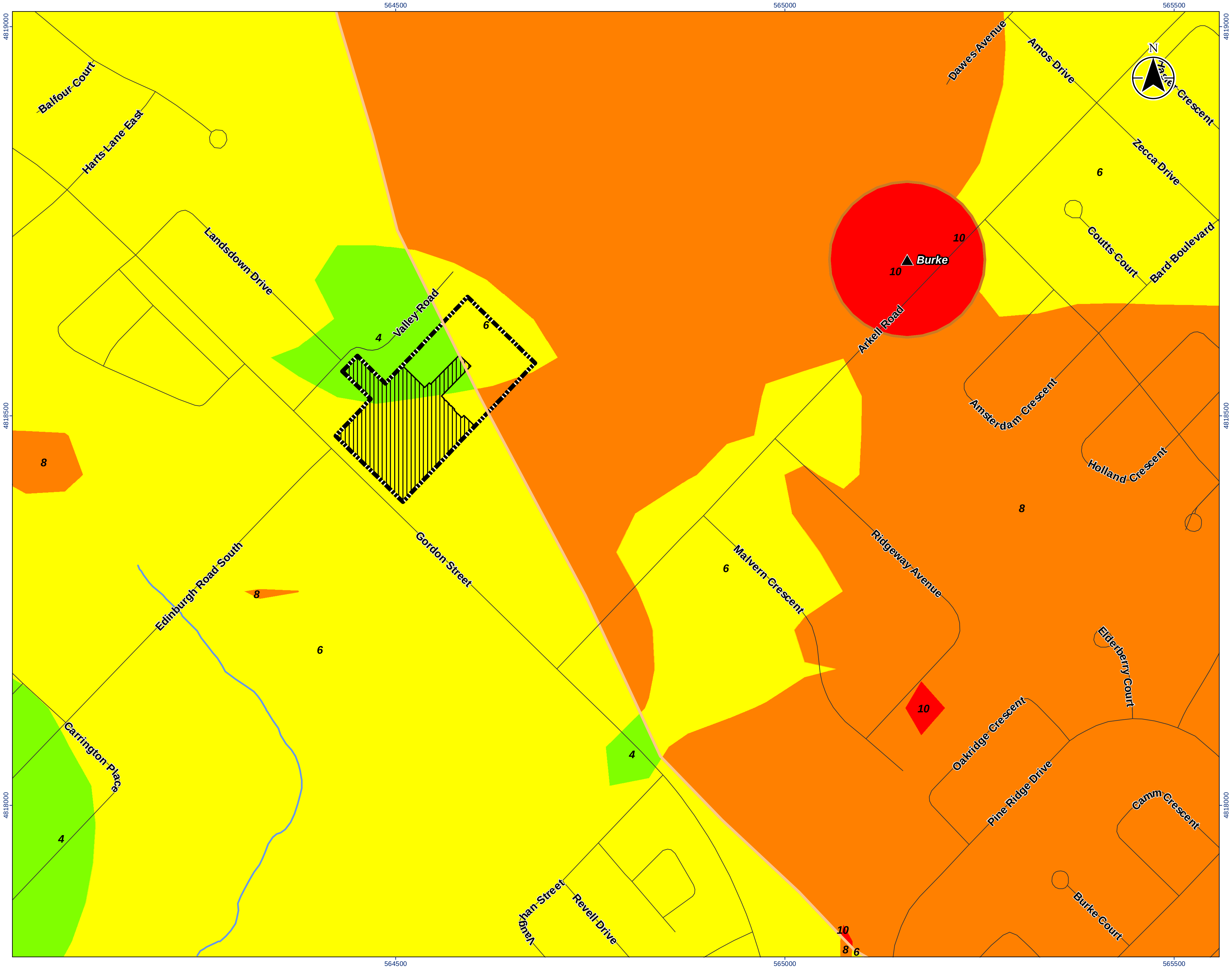
Project Location
City of Guelph

161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
5

Title
Wellhead Protection Areas



Stantec

Legend

▨ Site Boundary

▥ Proposed Development Footprint

— Watercourse (Permanent)

Wellhead Protection Areas

☐ WHPA-A

☐ WHPA-B

☐ WHPA-C

Vulnerability Scoring

🟩 4

🟨 6

🟧 8

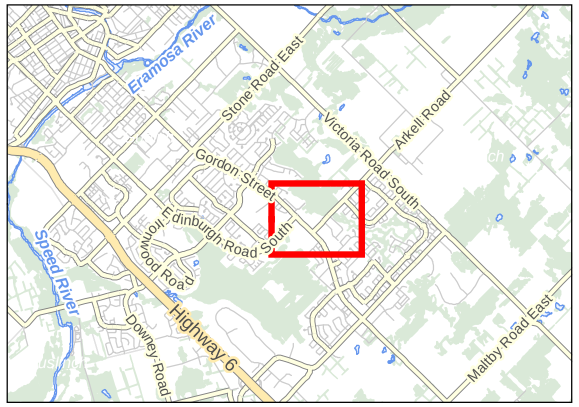
🟥 10

0 125 250 Metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Wellhead protection areas © Grand River Conservation, 2018.



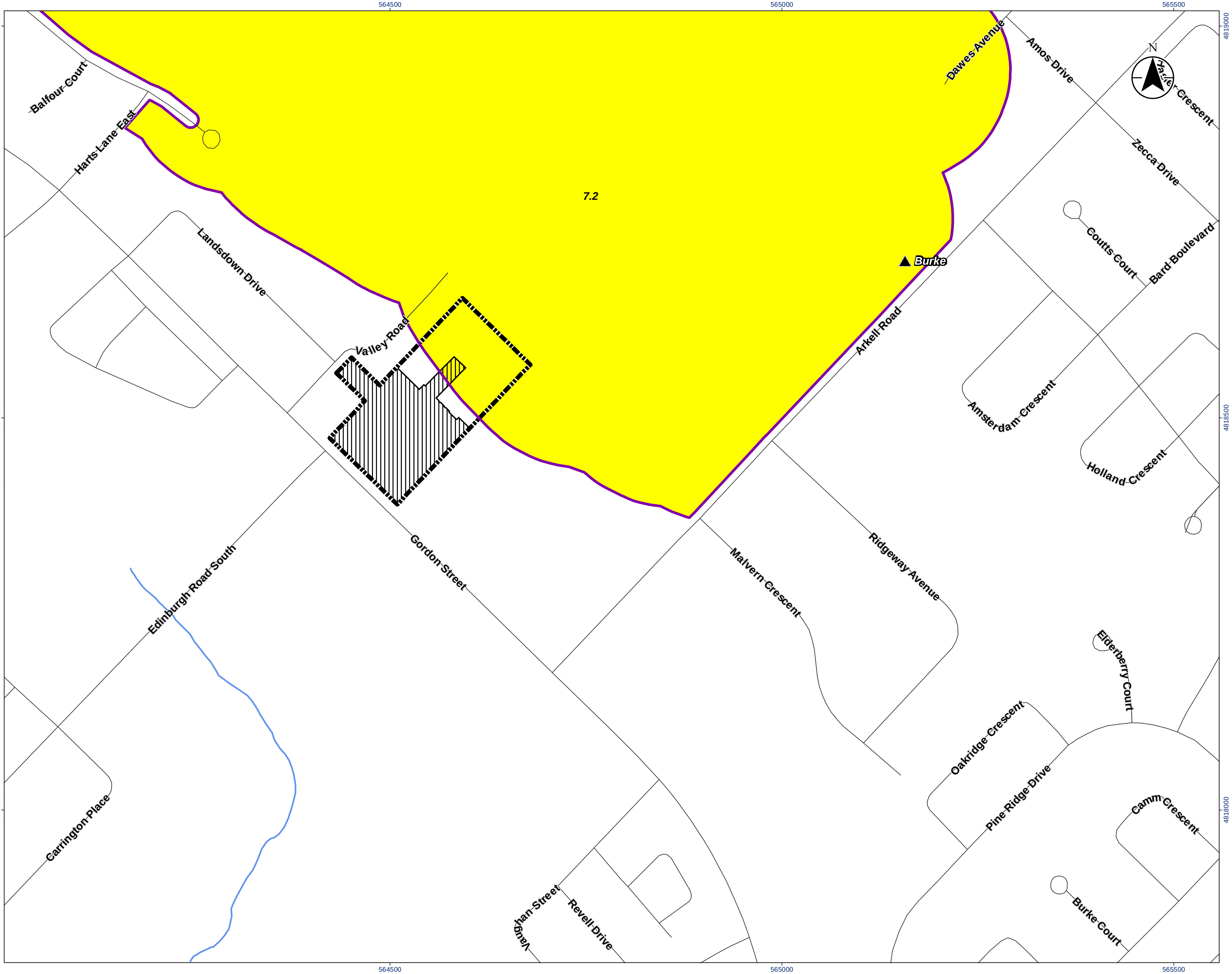
Project Location
City of Guelph

161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
6

Title
WHPA Vulnerability Scores

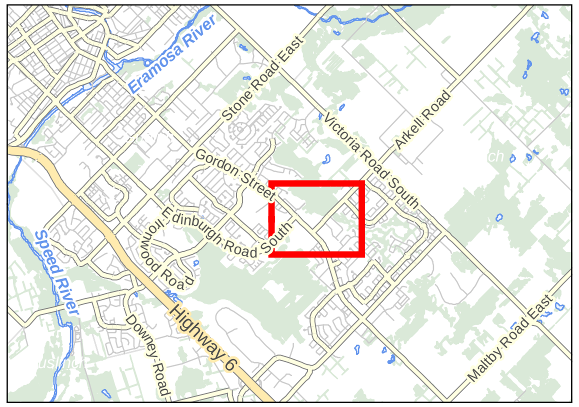


Stantec

Legend
▨ Site Boundary
▥ Proposed Development Footprint
— Watercourse (Permanent)
Wellhead Protection Areas
☐ WHPA-E (GUDI)
Vulnerability Scoring
🟨 7.2

0 125 250 Metres
1:5,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Wellhead protection areas © Grand River Conservation, 2018.



Project Location
City of Guelph

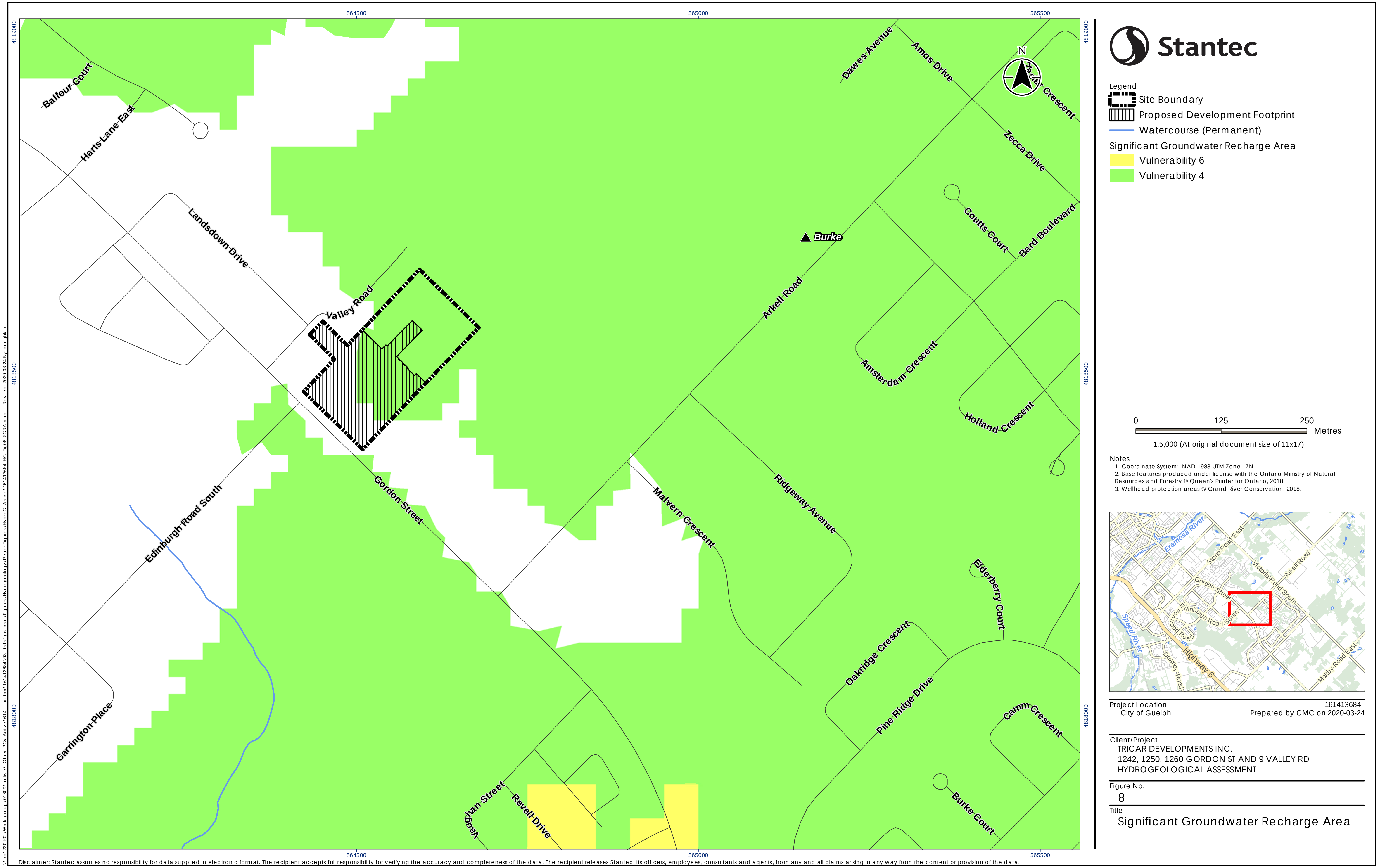
161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
7

Title
WHPA-E Vulnerability Scores

\\cd1220-f02\Work_group\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig07_VulnerabilityGUDI.mxd Revised: 2020-03-24 By: ccoghlan



Stantec

Legend

▨ Site Boundary

▥ Proposed Development Footprint

— Watercourse (Permanent)

Significant Groundwater Recharge Area

🟨 Vulnerability 6

🟩 Vulnerability 4

0 125 250 Metres

1:5,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Wellhead protection areas © Grand River Conservation, 2018.

Project Location
City of Guelph

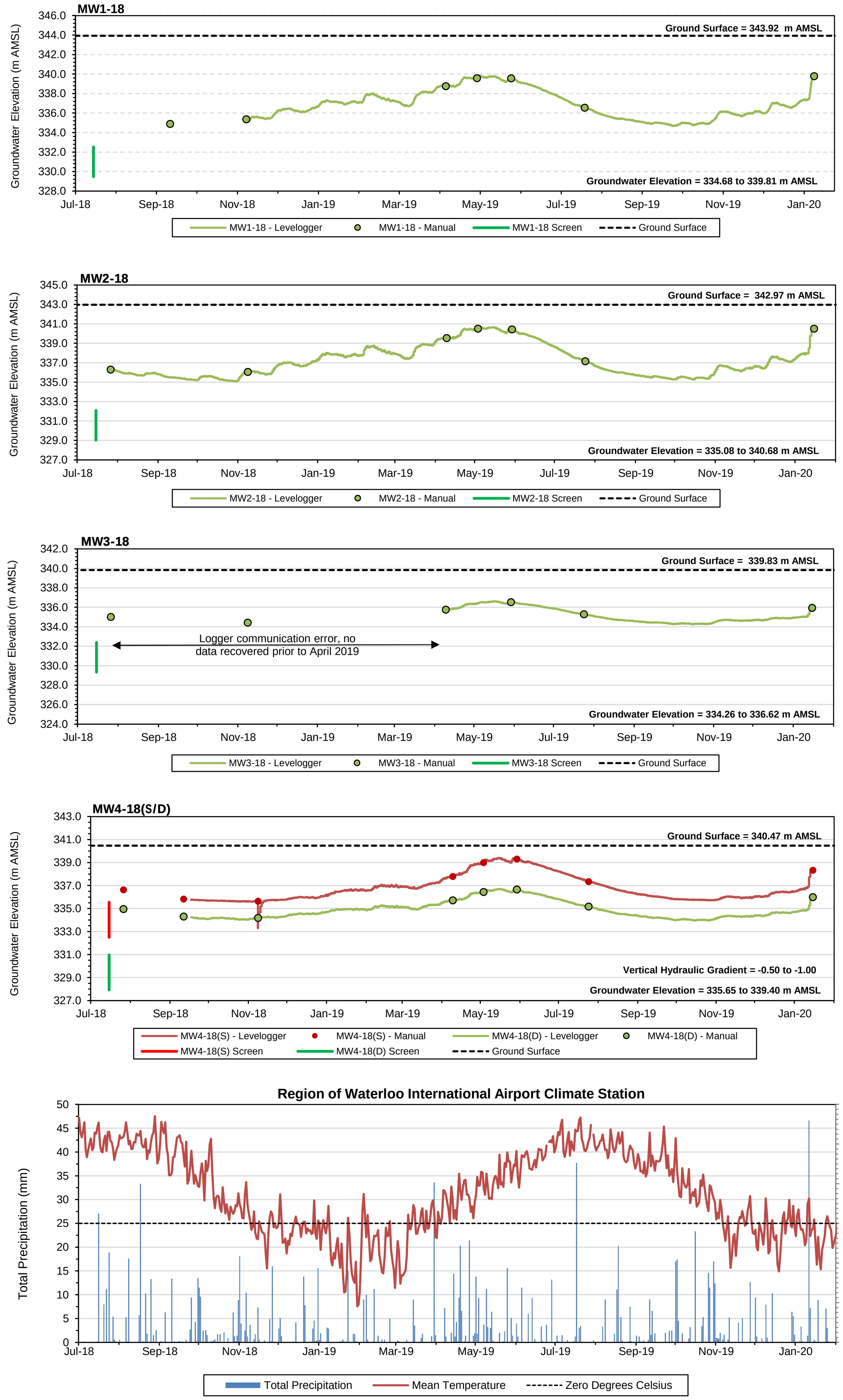
161413684
Prepared by CMC on 2020-03-24

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
8

Title
Significant Groundwater Recharge Area

\\cd1220-f02\Work_group\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig08_SGRA.mxd Revised: 2020-03-24 By: ccoghlan



Precipitation and temperature data obtained from Environment Canada for the Region of Waterloo International Airport Climate Station (ID 6144239), accessed February 2020.

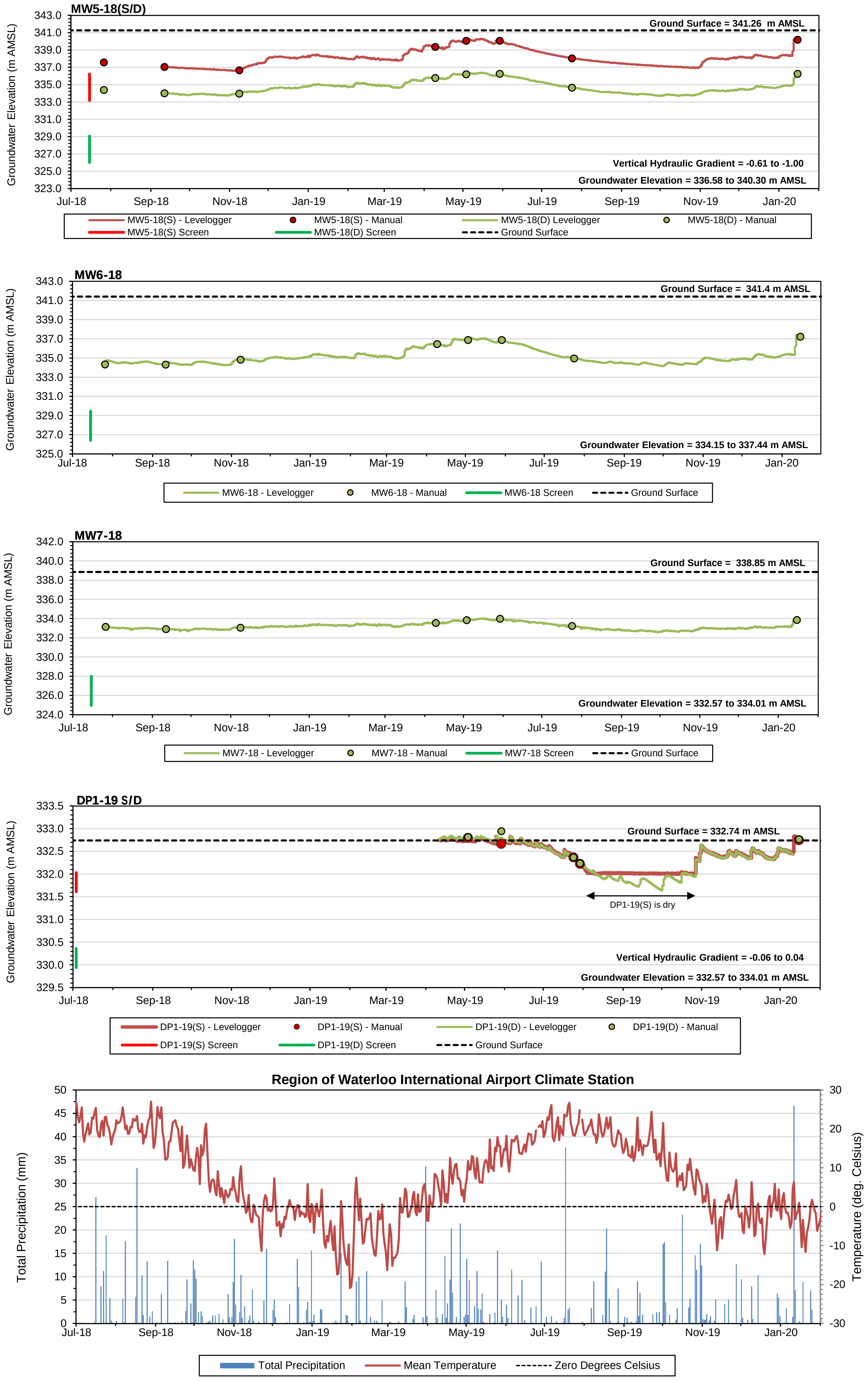
Client/Project

Tricar Developments Inc.
1242, 1250, 1260 Gordon Street and 9 Valley Road, Guelph
Hydrogeological Assessment

Figure No.

9

Title **HYDROGRAPHS**
MW1-18 to MW4-18



Precipitation and temperature data obtained from Environment Canada for the Region of Waterloo International Airport Climate Station (ID 6144239), accessed February 2020.

Client/Project

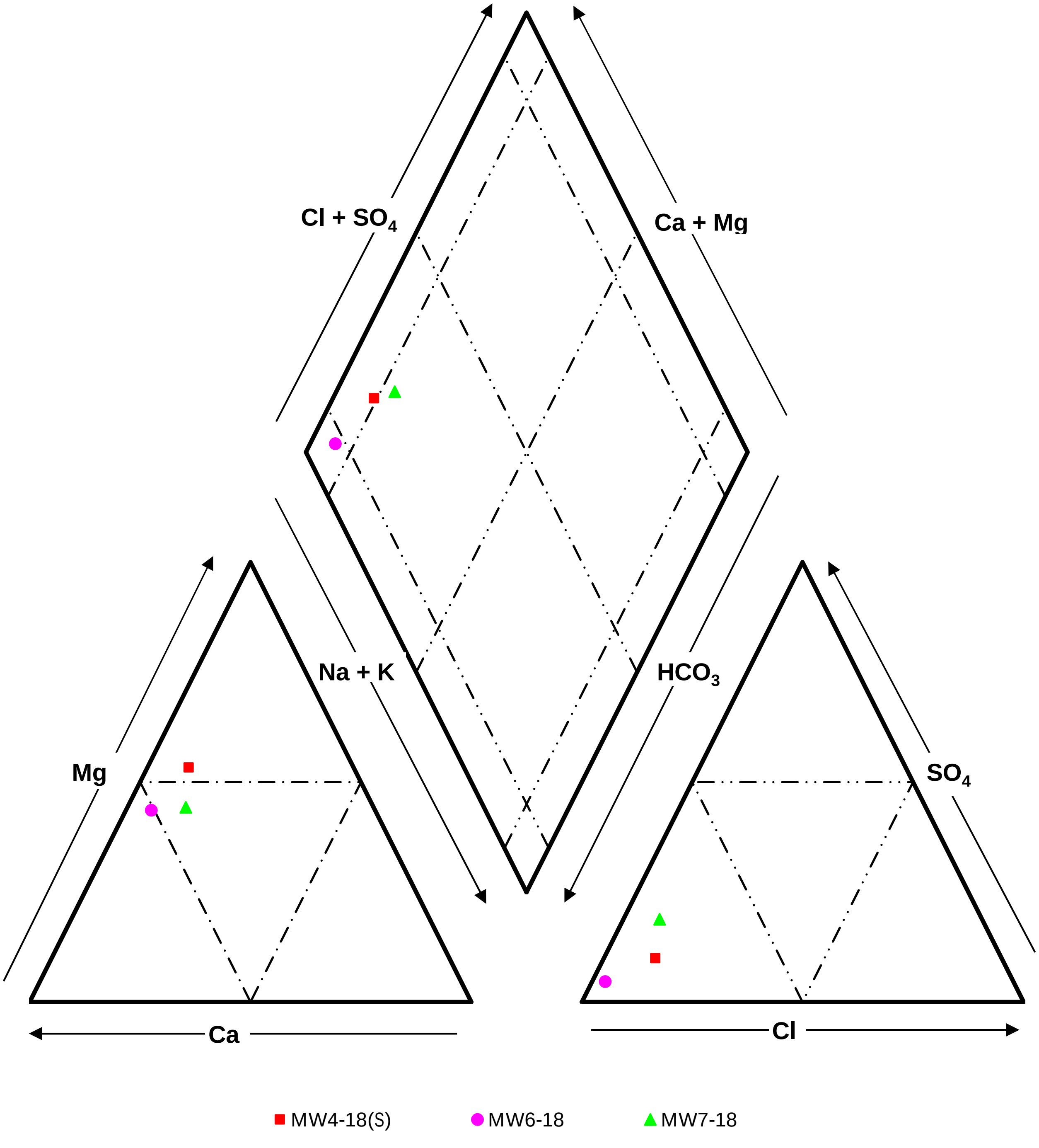
Tricar Developments Inc.
1242, 1250, 1260 Gordon Street and 9 Valley Road, Guelph
Hydrogeological Assessment

Figure No.

10

Title

HYDROGRAPHS
MW5-18 to MW7-18 and DP1-19(S/D)

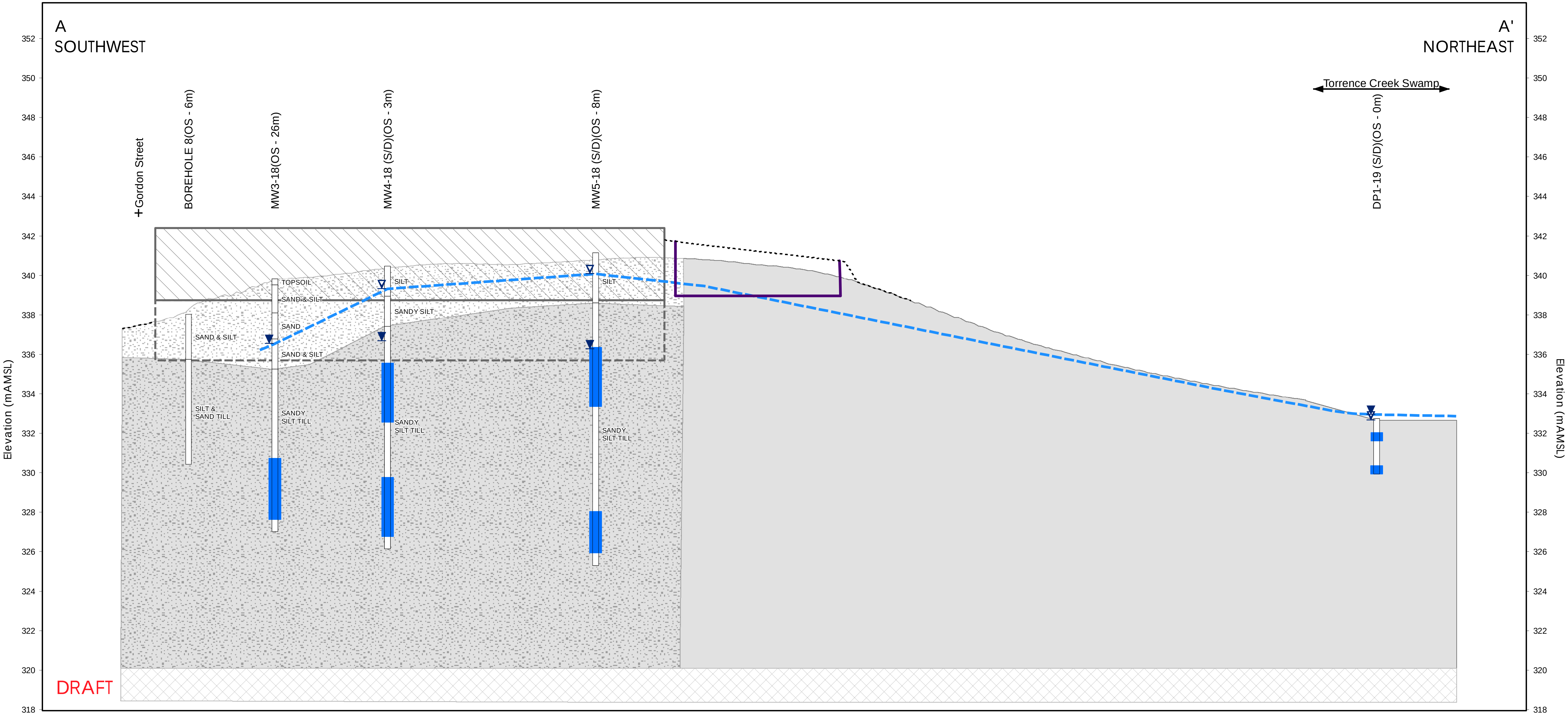


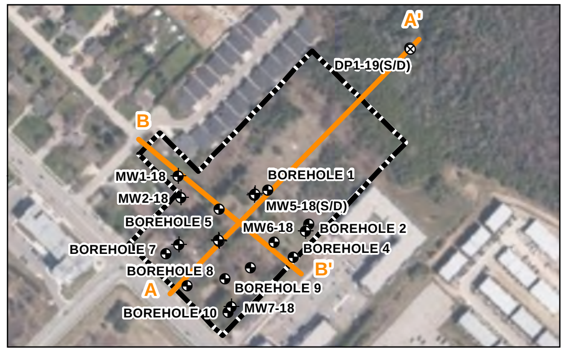
Stantec

1242, 1250, 1260 GORDON ST. AND 9 VALLEY DR.
HYDROGEOLOGICAL ASSESSMENT

PIPER DIAGRAM

DATE:	SCALE:	PROJECT No.	FIGURE No.
12-Apr-20		161413684	**11**





MW1-15 (OS m)

Well ID (Offset)

Sand Stratigraphy
▽ Water Level (Shallow Pipe)
▼ Water Level (Deep Pipe)
▮ Well Screen

- - - Interpreted Water Table (May 29, 2019)
······ Proposed Post Development Grade
— Proposed Infiltration Gallery
▨ Proposed Condo Building/Parking Level 1
⬚ Proposed Underground Parking Level 2
▭ Overburden (No Borehole Data Available)
▒ Diamicton (Silt, Sand, Gravel)
▒ Port Stanley Till (Silty Sand to Sandy Silt Till)
▨ Bedrock

5x Vertical Exaggeration
0 20 40 metres
1:1,000 (At original document size of 11x17)

Project Location
City of Guelph

161413684 REVA
Prepared by ccoghlan on 2020-04-28
Technical Review by xxx on xxxx-xx-xx

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
12

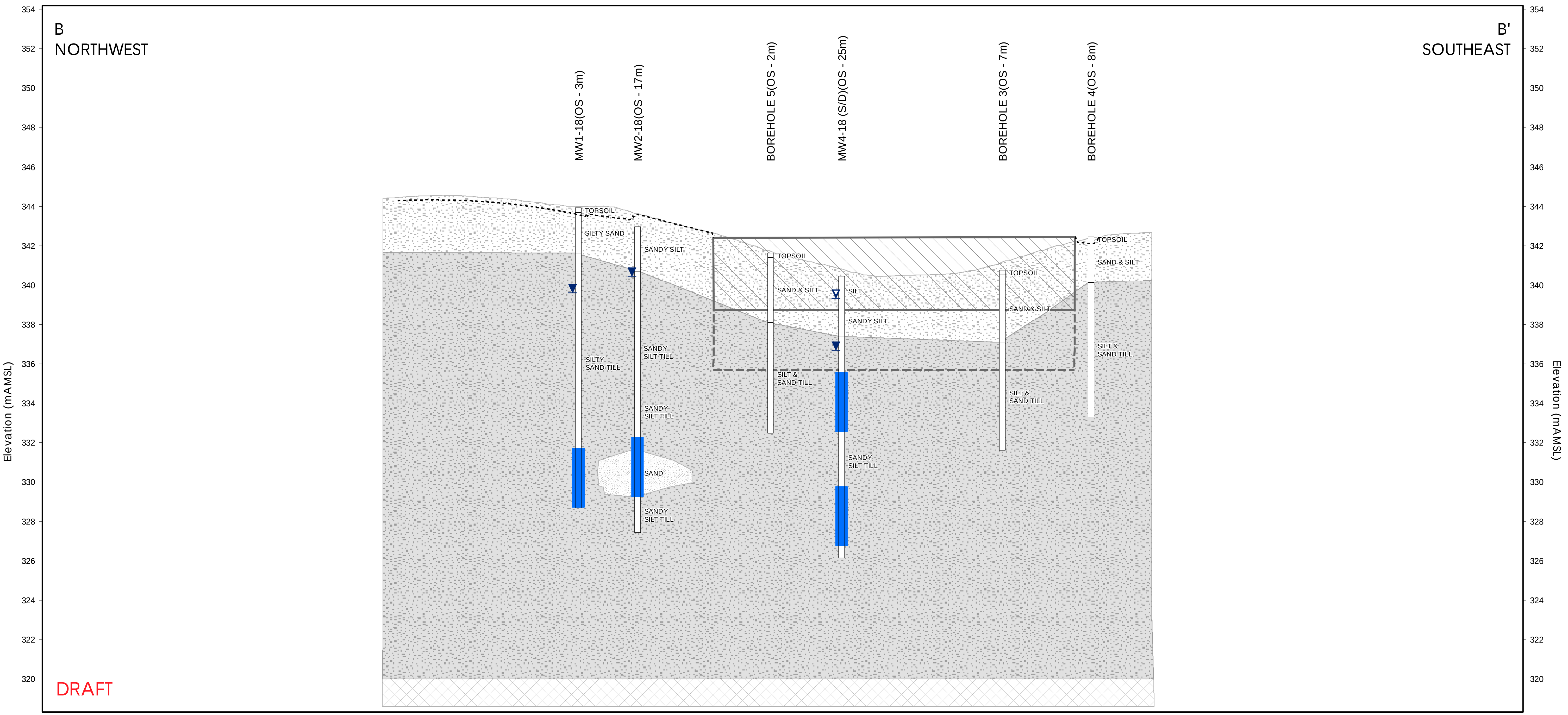
DRAFT

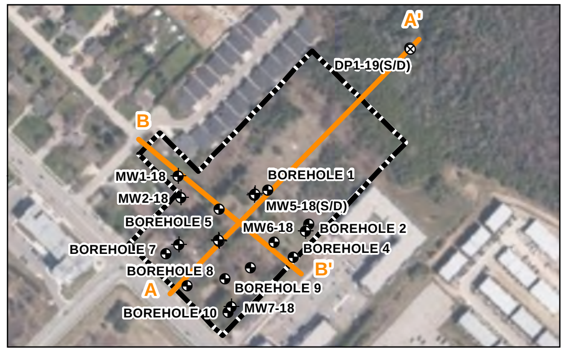
Title
Cross-Section A-A'

Notes
1. Groundwater levels measured on May 29, 2019.
2. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.

\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig12_xsecAA.mxd Revised: 2020-04-28 By: ccoghlan

\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig13_xsecBB.mxd Revised: 2020-04-29 By: ccoghlan





Notes
1. Groundwater levels measured on May 29, 2019.
2. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2017.

MW1-15 (OS m) Well ID (Offset)

Sand Stratigraphy

▽ Water Level (Shallow Pipe)

▼ Water Level (Deep Pipe)

▮ Well Screen

- - - - Proposed Post Development Grade

▨ Proposed Condo Building/Parking Level 1

⬚ Proposed Underground Parking Level 2

▒ Overburden (No Borehole Data Available)

░ Diamicton (Silt, Sand, Gravel)

░ Sand

▒ Port Stanley Till (Silty Sand to Sandy Silt Till)

▩ Bedrock

5x Vertical Exaggeration

0 20 40 metres

1:1,000 (At original document size of 11x17)

Stantec

Project Location
City of Guelph

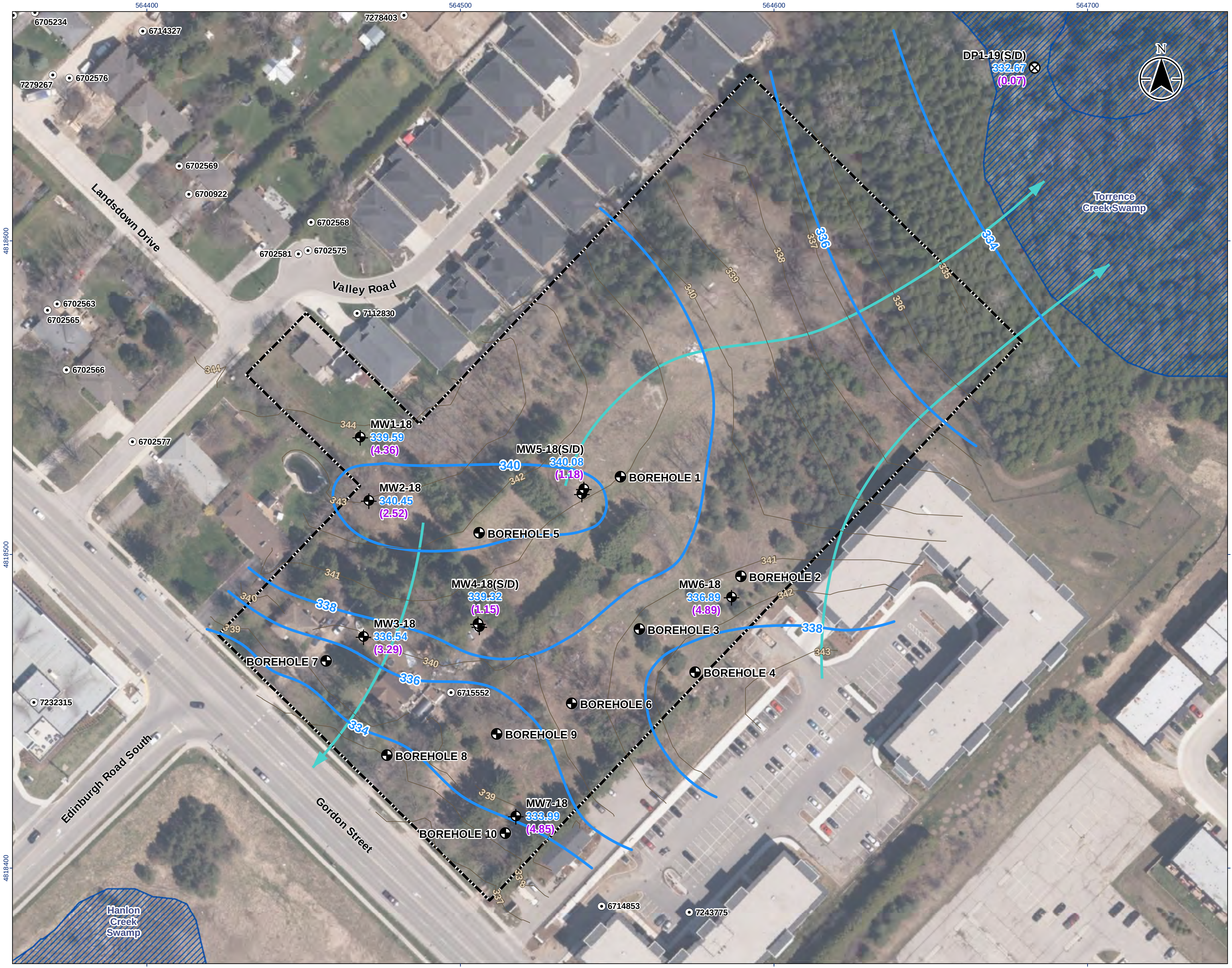
161413684 REVA
Prepared by ccoghlan on 2020-04-29
Technical Review by xxx on xxxx-xx-xx

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
13

DRAFT

Title
Cross-Section B-B'



Stantec

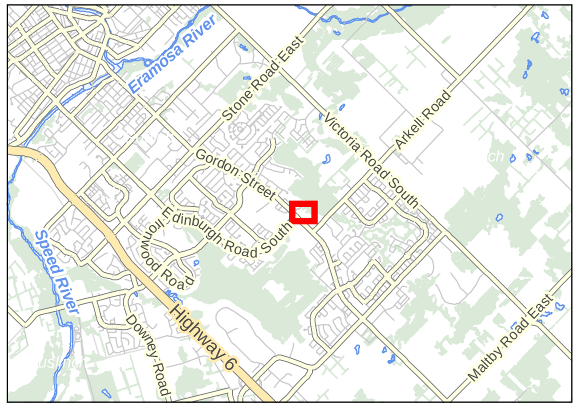
Legend

⬚	Site Boundary
⊕	Monitoring Well (Stantec, 2018)
⊗	Drive-Point Piezometer (Stantec, 2019)
◕	Borehole (CMT Engineering, 2018)
⊙	MECP Water Well
337.54	Groundwater Elevation (m AMSL) - May 29, 2019
(4.35)	Groundwater Depth (m BGS)
—	Groundwater Contour (m AMSL)
→	Interpreted Direction of Groundwater Flow
—	Topographic Contour (m AMSL)
▨	Wetland - Evaluated (Provincial)

0 25 50 Metres

1:1,250 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2017.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



Project Location
City of Guelph

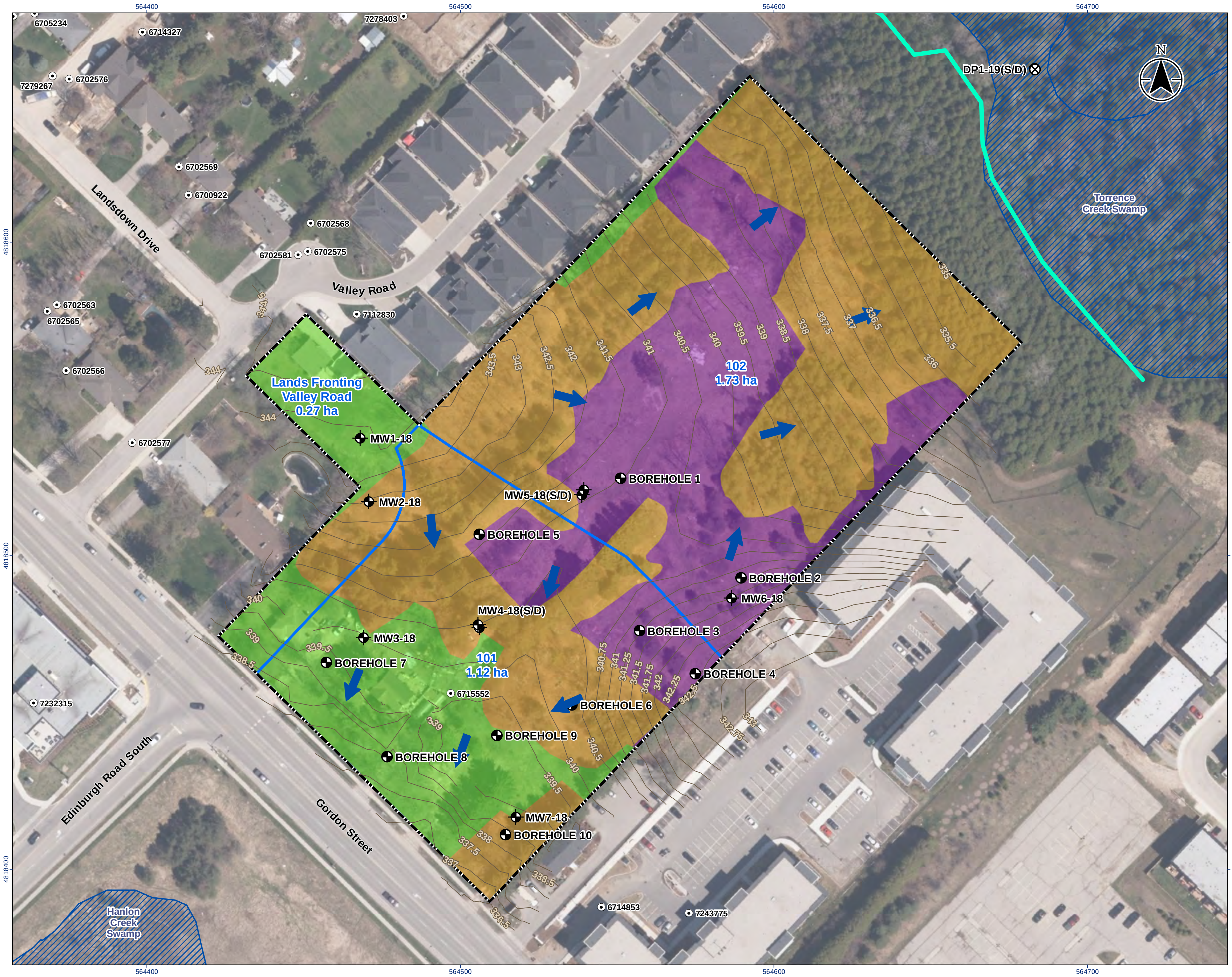
161413684
Prepared by CMC on 2020-03-27

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
14

Title
Groundwater Flow

\\cd1220-f02\WORK_GROUP\01609\active_Other PCs\Active\1614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig14_GrdwFlow.mxd Revised: 2020-03-27 By: CCoghlan



Stantec

Legend

- ⬚ Site Boundary
- ⊕ Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ● Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- ━ Approximate GRCA Wetland Boundary (2014)
- ➡ Major Overland Flood Route
- ─ Topographic Contour (m AMSL)
- ☐ Drainage Boundary
- ▨ Wetland - Evaluated (Provincial)

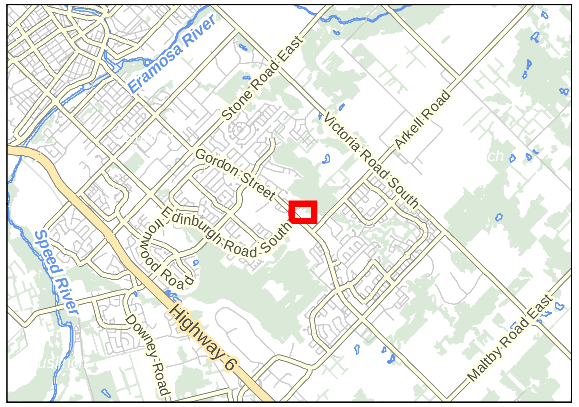
Water Balance Sub Areas

- 🟧 Sub-Area A (Hilly, Fine Sandy Loam, Mature Forest)
- 🟪 Sub-Area B (Hilly, Fine Sandy Loam, Pasture and Shrubs)
- 🟩 Sub-Area C (Hilly, Fine Sandy Loam, Urban Lawn)

0 25 50 Metres

1:1,250 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



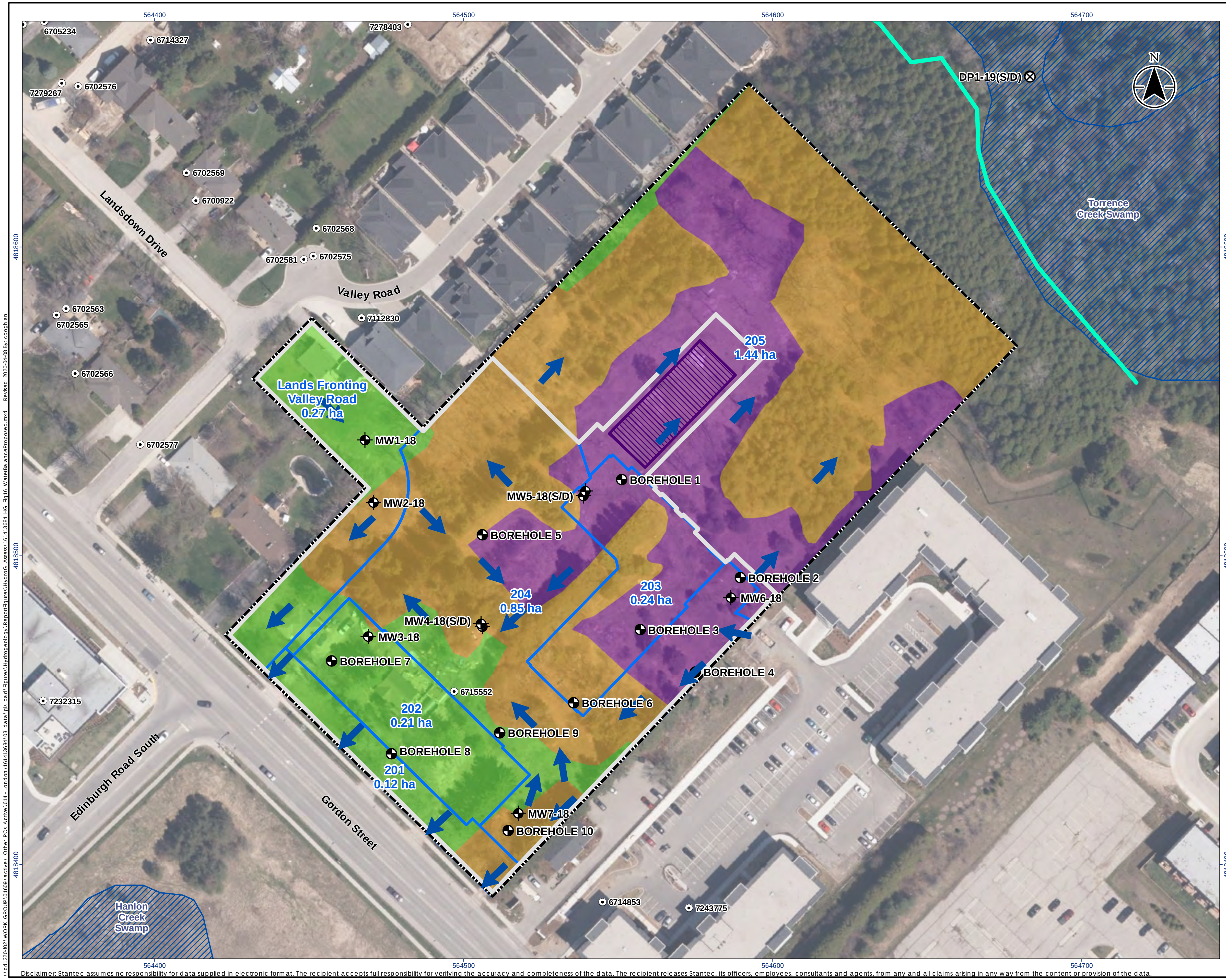
Project Location 161413684
City of Guelph Prepared by CMC on 2020-04-07

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
15

Title
Water Balance - Existing Conditions

\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig15_WaterBalanceExisting.mxd Revised: 2020-04-07 By: ccoghlan



\\cd1220-f02\WORK_GROUP\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig16_WaterBalanceProposed.mxd Revised: 2020-04-08 By: ccoghlan

Legend

- Site Boundary
- Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- Proposed Development Footprint
- Approximate GRCA Wetland Boundary (2014)
- Major Overland Flood Route
- Drainage Boundary
- ▨ Proposed Infiltration Gallery
- ▨ Wetland - Evaluated (Provincial)

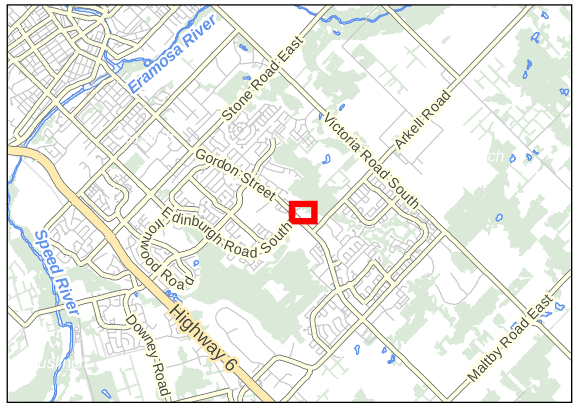
Water Balance Sub Areas

- Sub-Area A (Hilly, Fine Sandy Loam, Mature Forest)
- Sub-Area B (Hilly, Fine Sandy Loam, Pasture and Shrubs)
- Sub-Area C (Hilly, Fine Sandy Loam, Urban Lawn)

0 25 50 Metres

1:1,250 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



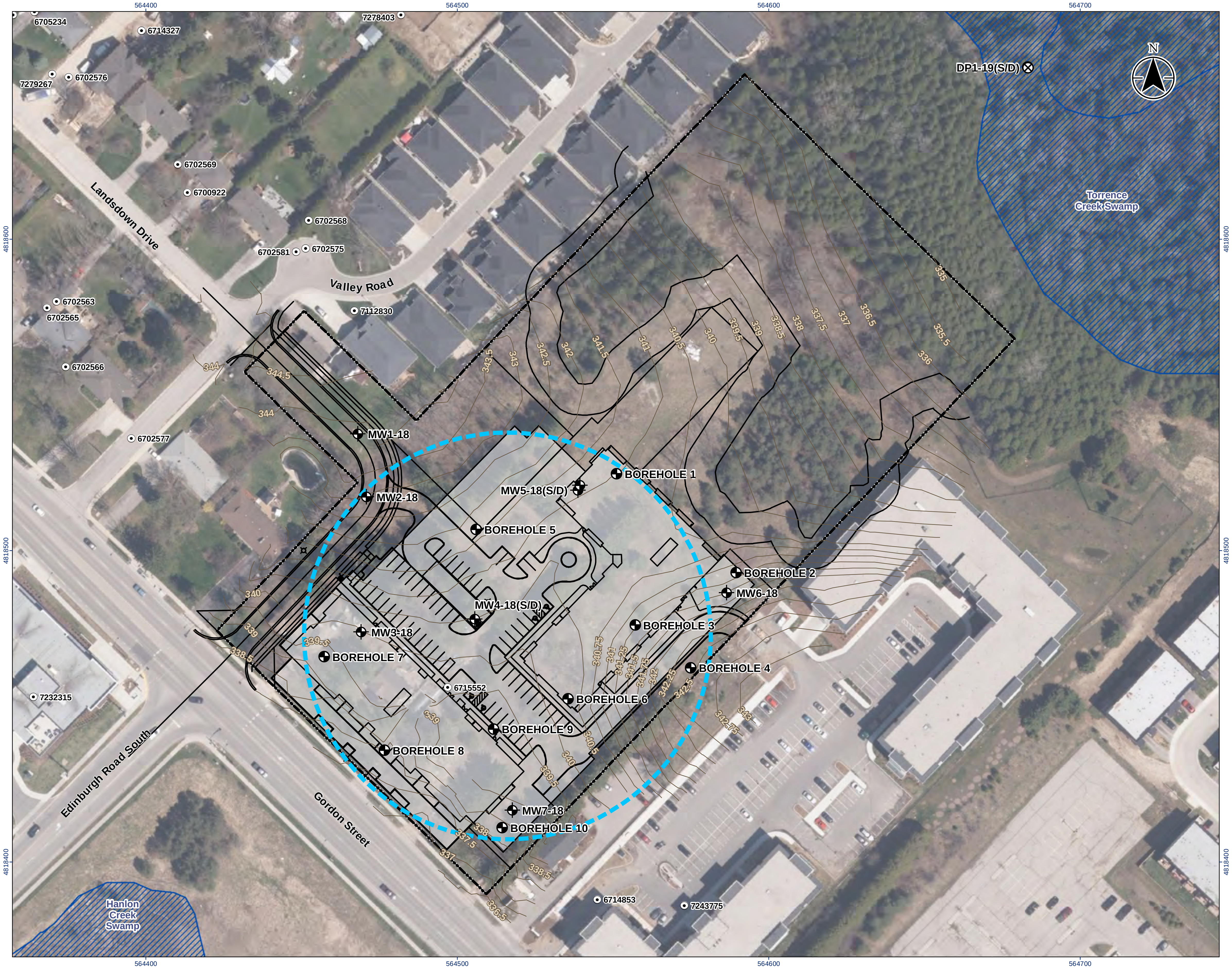
Project Location
City of Guelph

161413684
Prepared by CMC on 2020-04-08

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
16

Title
Water Balance - Proposed Conditions



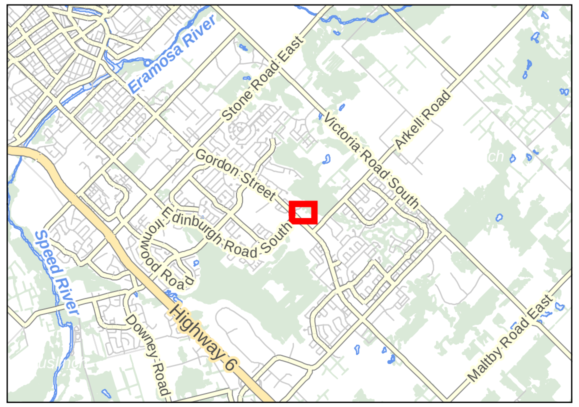
Stantec

Legend
- ⬚ Site Boundary
- ⌖ Monitoring Well (Stantec, 2018)
- ⊗ Drive-Point Piezometer (Stantec, 2019)
- ◐ Borehole (CMT Engineering, 2018)
- ⊙ MECP Water Well
- — Proposed Development Plan
- — Topographic Contour (m AMSL)
- ⬚ Dewatering Radius of Influence
- ▭ Proposed Extent of Underground Parking
- ▨ Wetland - Evaluated (Provincial)

0 25 50 Metres

1:1,250 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2020.
3. Orthoimagery © First Base Solutions, 2018. Imagery flown in 2019.
4. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.



Project Location
City of Guelph

161413684
Prepared by CMC on 2020-04-09

Client/Project
TRICAR DEVELOPMENTS INC.
1242, 1250, 1260 GORDON ST AND 9 VALLEY RD
HYDROGEOLOGICAL ASSESSMENT

Figure No.
17

Title
Dewatering Radius of Influence

\\cd1220-f02\WORK_GROUP\01609\active\1614 - London\161413684\03_data\gis_cad\Figures\Hydrogeology\ReportFigures\HydroG_Assess\161413684_HG_Fig17_DewateringRadius.mxd Revised: 2020-04-09 By: ccoghlan

APPENDIX B:
TABLES

TABLE 1
WELL CONSTRUCTION DETAILS

Well ID	UTM Coordinates		Elevations		Well Stick-up (m)	Well Depth (m BTOC)	Well Depth (m BGS)	Well Base Elevation (m AMSL)	Screened Interval				Screened Material Description $^{(a)}$	Hydraulic Conductivity $^{(b)}$ (m/s)
	Northing	Easting	Top of Casing (m AMSL)	Ground Surface (m AMSL)					Top Elevation		Bottom Elevation			
									(m BGS)	(m AMSL)	(m BGS)	(m AMSL)		
Stantec Monitoring Wells														
MW1-18	4818537	564468	344.72	343.92	0.77	15.99	15.22	328.70	12.17	331.75	15.22	328.70	Sandy SILT TILL	-
MW2-18	4818517	564471	343.77	342.97	0.80	14.74	13.94	329.03	10.89	332.08	13.94	329.03	Sandy SILT TILL (19%) / SAND (81%)	4.7E-07
MW3-18	4818474	564469	340.91	339.83	1.08	13.30	12.22	327.61	9.17	330.66	12.22	327.61	Sandy SILT TILL	1.6E-09
MW4-18(S)	4818478	564506	341.32	340.47	0.85	8.82	7.97	332.50	4.92	335.55	7.97	332.50	Sandy SILT TILL	1.8E-07
MW4-18(D)	4818478	564506	341.28	340.47	0.81	14.51	13.70	326.77	10.65	329.82	13.70	326.77	Sandy SILT TILL	3.4E-09
MW5-18(S)	4818521	564540	342.02	341.26	0.76	8.84	8.08	333.18	5.03	336.23	8.08	333.18	Sandy SILT TILL	1.2E-08
MW5-18(D)	4818519	564539	342.02	341.14	0.88	16.01	15.13	326.01	13.61	327.53	15.13	326.01	Sandy SILT TILL	2.0E-08
MW6-18	4818487	564586	342.55	341.40	1.15	16.14	14.99	326.41	13.47	327.93	14.99	326.41	Sandy SILT TILL	5.4E-07
MW7-18	4818416	564518	339.64	338.85	0.79	14.69	13.90	324.95	12.38	326.47	13.90	324.95	Sandy SILT TILL	5.8E-08
													GEOMEAN =	**3.7E-08**
Stantec Drive-Point Piezometers														
DP1-19(S)	4818655	564683	333.74	332.74	1.00	2.13	1.13	331.61	0.71	332.03	1.13	331.61	-	-
DP1-19(D)	4818655	564683	333.89	332.74	1.15	3.95	2.80	329.94	2.38	330.36	2.80	329.94	-	-

Notes:

(a) Refer to **Appendix E** for borehole and well construction logs

(b) Refer to **Appendix G** hydraulic conductivity analytical solutions

m AMSL = meters above mean sea level

m BGS = meters below ground surface

m BTOC = meters below top of well casing

\- = data not available

TABLE 2

GROUNDWATER LEVEL DATA - MONITORING WELLS

Well ID	UTM Coordinates		Date	Time	Well Depth			Screen Length	Screen Separation (1)	Top of Casing Elevation (m AMSL)	Ground Surface Elevation (m AMSL)	Pipe Stick-up (m)	Groundwater Level			Vertical Hydraulic Gradient (3)
	Northing	Easting			(m BTOC)	(m BGS)	(m AMSL)	(m)	(m)				(m BGS) (2)	(m BTOC)	(m AMSL)	(+) = Upward (-) = Downward
MW1-18	4818537	564468	26-Jul-18	10:15 AM	15.99	15.22	329.50	3.05		344.72	343.92	0.77	-	-	-	
			11-Sep-18	9:17 AM									9.03	9.80	334.89	
			8-Nov-18	9:10 AM									8.57	9.34	335.35	
			9-Apr-19	2:14 PM									5.16	5.93	338.76	
			3-May-19	8:41 AM									4.34	5.11	339.58	
			29-May-19	11:07 AM									4.36	5.13	339.56	
			24-Jul-19	11:30 AM									7.38	8.15	336.54	
			15-Jan-20	10:55 AM									4.15	4.92	339.77	
MW2-18	4818517	564471	26-Jul-18	3:58 PM	14.74	13.94	329.83	3.05		343.77	342.97	0.80	6.65	7.45	336.32	
			11-Sep-18	-									-	-	-	
			8-Nov-18	9:33 AM									6.90	7.70	336.07	
			9-Apr-19	2:14 PM									3.42	4.22	339.55	
			3-May-19	8:52 AM									2.44	3.24	340.53	
			29-May-19	11:15 AM									2.52	3.32	340.45	
			24-Jul-19	11:41 AM									5.80	6.60	337.17	
			15-Jan-20	11:04 AM									2.45	3.25	340.52	
MW3-18	4818474	564469	26-Jul-18	2:56 PM	13.30	12.22	328.69	3.05		340.91	339.83	1.08	4.81	5.89	335.02	
			11-Sep-18	-									-	-	-	
			8-Nov-18	9:45 AM									5.41	6.49	334.42	
			9-Apr-19	3:29 PM									4.07	5.15	335.76	
			3-May-19	10:55 AM									-	-	-	
			29-May-19	11:22 AM									3.29	4.37	336.54	
			24-Jul-19	11:41 AM									4.54	5.62	335.29	
			15-Jan-20	11:11 AM									3.89	4.97	335.94	
MW4-18(S)	4818478	564506	26-Jul-18	10:15 AM	8.82	7.97	333.35	3.05		341.32	340.47	0.85	3.83	4.68	336.64	
			11-Sep-18	1:18 PM									4.63	5.48	335.84	
			8-Nov-18	10:54 AM									4.81	5.66	335.66	
			9-Apr-19	3:26 PM									2.66	3.51	337.81	
			3-May-19	10:34 AM									1.45	2.30	339.02	
			29-May-19	12:20 PM									1.15	2.00	339.32	
			24-Jul-19	11:56 AM									3.11	3.96	337.36	
			15-Jan-20	12:06 PM									2.12	2.97	338.35	
MW4-18(D)	4818478	564506	26-Jul-18	10:16 AM	14.51	13.70	327.58	3.05	2.68	341.28	340.47	0.81	5.49	6.30	334.98	-0.62
			11-Sep-18	1:20 PM									6.15	6.96	334.32	-0.57
			8-Nov-18	10:54 AM									6.27	7.08	334.20	-0.54
			9-Apr-19	3:23 PM									4.73	5.54	335.74	-0.77
			3-May-19	10:35 AM									4.01	4.82	336.46	-0.96
			29-May-19	12:18 PM									3.79	4.60	336.68	-0.99
			24-Jul-19	11:59 AM									5.28	6.09	335.19	-0.81
			15-Jan-20	12:08 PM									4.46	5.27	336.01	

TABLE 2
GROUNDWATER LEVEL DATA - MONITORING WELLS

Well ID	UTM Coordinates		Date	Time	Well Depth			Screen Length	Screen Separation (1)	Top of Casing Elevation (m AMSL)	Ground Surface Elevation (m AMSL)	Pipe Stick-up (m)	Groundwater Level			Vertical Hydraulic Gradient (3)
	Northing	Easting			(m BTOC)	(m BGS)	(m AMSL)	(m)	(m)				(m BGS) (2)	(m BTOC)	(m AMSL)	(+) = Upward (-) = Downward
MW5-18(S)	4818521	564540	26-Jul-18	11:27 AM	8.84	8.08	333.94	3.05		342.02	341.26	0.76	3.67	4.43	337.59	
			11-Sep-18	10:17 AM									4.20	4.96	337.06	
			8-Nov-18	10:28 AM									4.57	5.33	336.69	
			9-Apr-19	3:11 PM									1.89	2.65	339.37	
			3-May-19	10:13 AM									1.17	1.93	340.09	
			29-May-19	11:57 AM									1.18	1.94	340.08	
			24-Jul-19	12:29 PM									3.21	3.97	338.05	
			15-Jan-20	11:20 AM									1.06	1.82	340.20	
MW5-18(D)	4818519	564539	26-Jul-18	11:24 AM	14.69	13.81	328.21	1.52	4.21	342.02	341.14	0.88	6.72	7.60	334.42	-0.75
			11-Sep-18	10:18 AM									7.11	7.99	334.03	-0.72
			8-Nov-18	10:23 AM									7.15	8.03	333.99	-0.64
			9-Apr-19	3:09 PM									5.35	6.23	335.79	-0.85
			3-May-19	10:14 AM									4.92	5.80	336.22	-0.92
			29-May-19	11:51 AM									4.87	5.75	336.27	-0.90
			24-Jul-19	12:31 PM									6.46	7.34	334.68	-0.80
			15-Jan-20	11:22 AM									4.87	5.75	336.27	-0.93
MW6-18	4818487	564586	26-Jul-18	1:05 PM	16.14	14.99	329.73	3.05		342.55	341.40	1.15	7.43	8.20	334.35	
			11-Sep-18	11:20 AM									7.45	8.22	334.33	
			8-Nov-18	10:14 AM									6.93	7.70	334.85	
			9-Apr-19	2:52 PM									5.31	6.08	336.47	
			3-May-19	10:03 AM									4.89	5.66	336.89	
			29-May-19	11:43 AM									4.89	5.66	336.89	
			24-Jul-19	12:18 PM									6.80	7.57	334.98	
			15-Jan-20	11:45 AM									4.53	5.30	337.25	
MW7-18	4818416	564518	26-Jul-18	2:04 PM	14.69	13.90	329.87	1.52		339.64	338.85	0.79	5.70	6.50	333.14	
			11-Sep-18	12:00 PM									5.92	6.72	332.92	
			8-Nov-18	10:03 AM									5.79	6.59	333.05	
			9-Apr-19	2:42 PM									5.28	6.08	333.56	
			3-May-19	9:51 AM									4.99	5.79	333.85	
			29-May-19	11:34 AM									4.85	5.65	333.99	
			24-Jul-19	12:07 PM									5.60	6.40	333.24	
			15-Jan-20	11:55 AM									4.98	5.78	333.86	

Notes:

(1) Distance between the top of the screen in the deep well and the bottom of screen in the shallow well.
(2) A negative value indicates that the water level measured within the pipe is located above ground surface
(3) Negative and positive values indicate downward and upward gradients, respectively.

m BGS = meters below ground surface
m BTOC = meters below top of casing
DRY = no groundwater or surface water was observed in the piezometer or watercourse, respectively

TABLE 3
GROUNDWATER LEVEL DATA - DRIVE-POINT PIEZOMETERS

Piezometer ID	UTM Coordinates		Total Depth		Screen Length	Screen Separation (1)	Pipe Stick-up	Ground Surface Elevation	Top of Casing Elevation	Date	Time	Groundwater Level			Surface Water Level		Vertical Hydraulic Gradient(4) (+) = Upward (-) = Downward
	Northing	Easting	(m BTOC)	(m BGS)	(m)	(m)	(m)	(m AMSL)	(m AMSL)			(m BGS) (2)	(m BTOC)	(m AMSL)	(m BTOC) (3)	(m AMSL)	
DP1-19(S)	4818655	564683	2.13	1.13	0.30		1.00	332.74	333.74	3-May-19	9:10 AM	-0.06	0.94	332.80	0.90	332.84	
										29-May-19	10:48 AM	0.07	1.07	332.67	DRY	-	
										24-Jul-19	11:02 AM	0.37	1.37	332.37	DRY	-	
										29-Jul-19	3:08 PM	0.51	1.51	332.23	DRY	-	
										15-Jan-20	10:34 AM	-0.01	0.99	332.75	DRY		
DP1-19(D)	4818655	564683	3.95	2.80	0.30	1.67	1.15	332.74	333.89	3-May-19	9:15 AM	-0.08	1.07	332.82	1.03	332.86	0.01
										29-May-19	10:48 AM	-0.21	0.94	332.95	DRY	-	0.17
										24-Jul-19	11:02 AM	0.37	1.52	332.37	DRY	-	0.00
										29-Jul-19	3:08 PM	0.50	1.65	332.24	DRY	-	0.01
										15-Jan-20	10:37 AM	-0.03	1.12	332.77	DRY		0.01

Notes:

(1) Distance between the mid-point of the screened intervals of the shallow and deep piezometer.
(2) A negative value indicates that the water level measured within the pipe is located above ground surface
(3) A negative value indicates that the surface water level is above the top of the piezometer
(4) Vertical hydraulic gradient between the surface water feature substrate and the piezometer screened interval.

m BGS = meters below ground surface
m BTOC = meters below top of casing
DRY = no groundwater or surface water was observed in the piezometer or surface water feature, respectively
n/a = measurement not available

TABLE 4 - INFILTRATION TESTING RESULTS

Testing Location ID	Horizontal Hydraulic Conductivity	Vertical Hydraulic Conductivity		Infiltration Rate	Pit Depth	Screened Interval	Soil Substrate Tested	Surficial Deposit or Hydrostratigraphic Unit
	(m/s)	(cm/s)	(m/s)	(mm/hr)	(m BGS)	(m BGS)		
In-situ Hydraulic Response Testing (Monitoring Wells)								
MW2-18	4.7E-07	-	4.7E-08	20	-	10.9 - 13.9	Sandy SILT TILL (19%) / SAND (81%)	Lower Till Aquitard (Sand Layer)
MW3-18	1.6E-09	-	1.6E-10	5	-	7.5 - 10.5	Sandy SILT TILL	Lower Till Aquitard
MW4-18(S)	1.8E-07	-	1.8E-08	15	-	5.0 - 8.0	Sandy SILT TILL	Lower Till Aquitard
MW4-18(D)	3.4E-09	-	3.4E-10	5	-	9.5 - 12.5	Sandy SILT TILL	Lower Till Aquitard
MW5-18(S)	1.2E-08	-	1.2E-09	8	-	5.0 - 8.0	Sandy SILT TILL	Lower Till Aquitard
MW5-18(D)	2.0E-08	-	2.0E-09	9	-	12.1 - 15.1	Sandy SILT TILL	Lower Till Aquitard
MW6-18	5.4E-07	-	5.4E-08	21	-	12.0 - 15.0	Sandy SILT TILL	Lower Till Aquitard
MW7-18	5.8E-08	-	5.8E-09	12	-	10.9 - 13.9	Sandy SILT TILL	Lower Till Aquitard

Notes:

(1) Infiltration rate calculated based on established relationship between vertical hydraulic conductivity and infiltration rate presented in *Credit Valley Conservation and Toronto and Region Conservation (2010) Low Impact Stormwater Management Planning and Design Guideline - Version 1.0.*

(2) Vertical hydraulic conductivities for deeper overburden deposits assumed to be one order of magnitude lower than in-situ measured horizontal hydraulic conductivities

TABLE 5 - GROUNDWATER QUALITY RESULTS
CITY OF GUELPH SANITARY AND SEWER BY-LAW (1996)-15202

Sample Location			**MW2-18**	
Sample Date			**11-Sep-18**	**11-Sep-18**
Sample ID			**WG-161413684-20180911-DS-04**	**WG-161413684-20180911-DS-04 Lab-Dup**
Sampling Company			**STANTEC**	**STANTEC**
Laboratory			**MAXX**	**MAXX**
Laboratory Work Order			**B8N6455**	**B8N6455**
Laboratory Sample ID		**City of**	**HSJ715**	**HSJ715**
Sample Type	**Units**	**Guelph**		**Lab Replicate**
General Chemistry				
Chloride	mg/L	1,500^{A}	46	-
Cyanide	mg/L	2^{A}	<0.0050	-
Fluoride	mg/L	10^{A}	0.13	-
pH, lab	S.U.	5.5-9.5^{A} 6.0-9.0^{B}	7.90	-
Phenols-4AAP	mg/L	n/v	<0.0010	-
Sulfate	mg/L	1,500^{A}	40	-
Total Suspended Solids	mg/L	350^{A} 15^{B}	**2,500^{AB}**	-
Carbonaceous BOD - 5 Day	mg/L	n/v	<2	<2
Total Kjeldahl Nitrogen	mg/L	100^{A}	1.7	-
Petroleum Hydrocarbons				
Animal/Veg Oil & Grease	mg/L	100^{A}	<0.50	-
Mineral Oil and Grease	mg/L	n/v	<0.50	-
Oil and Grease, Total	mg/L	n/v	<0.50	-
Metals, Total				
Aluminum	mg/L	50^{A}	15	-
Antimony	mg/L	5^{A}	<0.00050	-
Arsenic	mg/L	1^{A}	0.0062	-
Bismuth	mg/L	5^{A}	<0.0010	-
Cadmium	mg/L	1^{A} 0.001^{B}	**0.0019^{B}**	-
Chromium	mg/L	5^{A} 0.2^{B}	0.040	-
Cobalt	mg/L	5^{A}	0.0096	-
Copper	mg/L	3^{A} 0.01^{B}	**0.030^{B}**	-
Iron	mg/L	50^{A}	23	-
Lead	mg/L	5^{A} 0.05^{B}	**0.13^{B}**	-
Manganese	mg/L	5^{A}	1.3	-
Mercury	mg/L	0.1^{A} 0.001^{B}	<0.0001	-
Molybdenum	mg/L	5^{A}	0.0032	-
Nickel	mg/L	3^{A} 0.05^{B}	0.021	-
Phosphorus	mg/L	10^{A}	1.1	-
Selenium	mg/L	5^{A}	<0.0020	-
Silver	mg/L	5^{A}	<0.00010	-
Tin	mg/L	5^{A}	0.0011	-
Titanium	mg/L	5^{A}	0.49	-
Vanadium	mg/L	5^{A}	0.031	-
Zinc	mg/L	3^{A} 0.05^{B}	**0.64^{B}**	-
Microbiological				
Fecal Coliform	5TMPN/100ML	200 (MPN/100mL)^{B}	**350^{B}**	-

Notes:

Guelph	City of Guelph
^{A}	City of Guelph Sanitary Sewer-Use By-Law No. (1996)-15202
^{B}	City of Guelph Storm Sewer-Use By-Law
6.5^{A}	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.

TABLE 6 - GROUNDWATER QUALITY RESULTS
ONTARIO DRINKING WATER QUALITY STANDARDS

Sample Location			**MW2-18**	**MW4-18(S)**	**MW6-18**	**MW7-18**
Sample Date			**11-Sep-18**	**11-Sep-18**	**11-Sep-18**	**11-Sep-18**
Sample ID			**WG-161413684-20180911-DS-04**	**WG-161413684-20180911-DS-03**	**WG-161413684-20180911-DS-01**	**WG-161413684-20180911-DS-02**
Sampling Company			**STANTEC**	**STANTEC**	**STANTEC**	**STANTEC**
Laboratory			**MAXX**	**MAXX**	**MAXX**	**MAXX**
Laboratory Work Order			**B8N6455**	**B8N6455**	**B8N6455**	**B8N6455**
Laboratory Sample ID	**Units**	**ODWS**	**HSJ715**	**HSJ714**	**HSJ712**	**HSJ713**
General Chemistry						
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	-	5.3	3.7	4.7
Alkalinity, Total (as CaCO3)	mg/L	30-500[E]	-	410	310	340
Ammonia (as N)	mg/L	n/v	-	0.071	<0.050	<0.050
Anion Sum	me/L	n/v	-	10.7	6.67	9.3
Bicarbonate(as CaCO3, Calculated)	mg/L	n/v	-	410	300	330
Cation Sum	me/L	n/v	-	10.9	6.66	11.8
Chloride	mg/L	250[C]	46	43	7	27
Dissolved Organic Carbon (DOC)	mg/L	5[C]	-	1.4	0.83	1
Electrical Conductivity, Lab	µmhos/cm	n/v	-	950	580	830
Hardness (as CaCO3)	mg/L	80-100[E]	-	**490[E]**	**320[E]**	**520[E]**
Ion Balance	%	n/v	-	1.08	0.05	12.1
Langelier Index (at 20 C)	none	n/v	-	1.2	1.01	1.25
Langelier Index (at 4 C)	none	n/v	-	0.947	0.762	0.997
Nitrate (as N)	mg/L	10.0[d][B]	-	1.93	0.25	0.12
Nitrate + Nitrite (as N)	mg/L	10.0[d][B]	-	1.96	0.25	0.12
Nitrite (as N)	mg/L	1.0[d][B]	-	0.026	<0.010	<0.010
Orthophosphate(as P)	mg/L	n/v	-	0.012	<0.010	<0.010
pH, lab	S.U.	6.5-8.5[E]	7.90	8.14	8.11	8.18
Saturation pH (at 20 C)	none	n/v	-	6.95	7.1	6.93
Saturation pH (at 4 C)	none	n/v	-	7.2	7.35	7.18
Sulfate	mg/L	500[h][C]	40	50	15	84
Total Dissolved Solids (Calculated)	mg/L	500[C]	-	**540[C]**	330	**530[C]**
Total Suspended Solids	mg/L	n/v	-	100	1,800	1,200
Metals, Dissolved						
Aluminum	mg/L	0.1[E]	-	0.0064	<0.0050	0.063
Antimony	mg/L	0.006[B]	-	<0.00050	<0.00050	<0.00050
Arsenic	mg/L	0.01[B]	-	<0.0010	<0.0010	0.0015
Barium	mg/L	1[B]	-	0.13	0.032	0.076
Beryllium	mg/L	n/v	-	<0.00050	<0.00050	<0.00050
Boron	mg/L	5[B]	-	0.11	0.014	0.013
Cadmium	mg/L	0.005[B]	-	<0.00010	<0.00010	<0.00010
Calcium	mg/L	n/v	-	82	69	100
Chromium	mg/L	0.05[B]	-	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	n/v	-	<0.00050	<0.00050	<0.00050
Copper	mg/L	1[C]	-	<0.0010	<0.0010	<0.0010
Iron	mg/L	0.3[C]	-	<0.10	<0.10	0.19
Lead	mg/L	0.01[B]	-	<0.00050	<0.00050	0.00056
Magnesium	mg/L	n/v	-	71	36	63
Manganese	mg/L	0.05[C]	-	0.02	0.011	0.046
Molybdenum	mg/L	n/v	-	0.0042	0.00079	0.003
Nickel	mg/L	n/v	-	<0.0010	<0.0010	<0.0010
Phosphorus	mg/L	n/v	-	0.11	<0.10	<0.10
Potassium	mg/L	n/v	-	5.9	1.1	2.6
Selenium	mg/L	0.05[B]	-	0.0022	<0.0020	<0.0020
Silicon	mg/L	n/v	-	5.2	6.3	7.9
Silver	mg/L	n/v	-	<0.00010	<0.00010	<0.00010
Sodium	mg/L	200[g][C] 20[g][D]	-	20	5.4	**34[D]**
Strontium	mg/L	n/v	-	0.23	0.13	0.2
Thallium	mg/L	n/v	-	<0.000050	<0.000050	<0.000050
Titanium	mg/L	n/v	-	<0.0050	<0.0050	0.0051
Uranium	mg/L	0.02[B]	-	0.003	0.00063	0.0022
Vanadium	mg/L	n/v	-	0.0012	<0.00050	0.0014
Zinc	mg/L	5[C]	-	<0.0050	<0.0050	<0.0050

Notes:

ODWS	O.Reg 169/03 - Ontario Drinking Water Quality Standards (January 1, 2018); Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006), in support of O.Reg 169/03 (January 1, 2018)
A	Schedule 1 - Microbiological Standards (expressed as a maximum)
B	Schedule 2 - Chemical Standards (expressed as a maximum acceptable concentration)
C	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
D	ODWS Table 4 - Medical Officer of Health Reporting Limit
E	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
g	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.

TABLE 7 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
CATCHMENT 101

Pre-Development

Model Type: Thornthwaite and Mather (1955)
Client: Tricar Developments Inc.
Location Catchment 101 (Lands Draining to Upper Hanlon Creek Watershed)
Total Site Area (ha) 1.13

Land Description Factors **(Sub-area descriptions provided below)**	**Sub-Area A**	**Sub-Area B**	**Sub-Area C**										**Total**
Topography	0.10	0.10	0.10										
Soils	0.25	0.25	0.25										
Cover	0.20	0.15	0.05										
Sum (Infiltration Factor)†	0.55	0.50	0.40										
Soil Moisture Capacity (mm)	300	150	75										
Site area (ha)	0.52	0.18	0.43										1.13
Imperviousness Coefficient	0.00	0.00	0.00										
Impervious Area (ha)	0.00	0.00	0.00										0.00
Percentage of Total Site Area	0.0%	0.0%	0.0%										0%
Remaining Pervious Area (ha)	0.52	0.18	0.43										1.13
Total Pervious Site Area (ha)	0.52	0.18	0.43										1.13
Percentage of Total Site Area	45.7%	15.9%	38.4%										100%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Waterloo Wellington A Climate Normals, 1981 - 2010) ‡													
Average Daily Temperature (°C)	-6.5	-5.5	-1	6.2	12.5	17.6	20	18.9	14.5	8.2	2.5	-3.3	**7.0**
Precipitation (mm)	65.2	54.9	61	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	**916**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.4	4.0	6.7	8.2	7.5	5.0	2.1	0.4	0.0	**35**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	29.0	60.8	87.2	99.8	94.0	71.1	39.0	11.1	0.0	**492**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET)(mm)	0	0	0	32	75	112	126	110	74	36	9	0	**573**
Precipitation - PET (mm)	65.2	54.9	61.0	42.0	7.6	-29.7	-27.0	-25.6	13.7	31.6	78.1	71.2	**343**
	0	0	0	100	100	100	100	100	100	100	100	0	
Evapotranspiration Analysis													
Sub-Area A	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	336	283	315	384	425	425	509	433	453	348	449	367	**4,728**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-65	-28	0	0	
Storage (S)	300	300	300	300	300	272	248	228	242	273	300	300	
Change in Storage	0	0	0	0	0	-28	-23	-20	14	32	27	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	111	122	104	74	36	9	0	**563**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	51	71	**353**
Potential Infiltration (I)	36	30	34	23	4	0	0	0	0	0	28	39	194
Potential Direct Surface Water Runoff (R)	29	25	27	19	3	0	0	0	0	0	23	32	159
Potential Infiltration (mm)	0	0	0	162	4	0	0	0	0	0	28	0	194
Pervious Evapotranspiration (m^3)	0	0	0	168	385	571	629	538	382	185	46	0	2,905
Pervious Runoff (m^3)	151	127	142	98	18	0	0	0	0	0	119	165	**820**
Pervious Infiltration (m^3)	0	0	0	835	22	0	0	0	0	0	146	0	**1,003**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE 7 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
CATCHMENT 101

Evapotranspiration Analysis													
Sub-Area B	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	117	98	109	133	147	147	176	150	157	121	156	127	**1,640**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-60	-19	0	0	
Storage (S)	150	150	150	150	150	123	103	87	100	132	150	150	
Change in Storage	0	0	0	0	0	-27	-20	-16	14	32	18	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	109	119	100	74	36	9	0	**554**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	60	71	**362**
Potential Infiltration (I)	33	27	31	21	4	0	0	0	0	0	30	36	181
Potential Direct Surface Water Runoff (R)	33	27	31	21	4	0	0	0	0	0	30	36	181
Potential Infiltration (mm)	0	0	0	147	4	0	0	0	0	0	30	0	181
Pervious Evapotranspiration (m^3)	0	0	0	58	134	196	213	179	133	64	16	0	992
Pervious Runoff (m^3)	58	49	55	38	7	0	0	0	0	0	54	64	**324**
Pervious Infiltration (m^3)	0	0	0	263	7	0	0	0	0	0	54	0	**324**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Evapotranspiration Analysis													
Sub-Area C	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	283	238	264	323	357	357	427	364	381	292	378	309	**3,972**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-50	-5	0	0	
Storage (S)	75	75	75	75	75	50	35	25	39	70	75	75	
Change in Storage	0	0	0	0	0	-25	-15	-10	14	32	5	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	107	114	94	74	36	9	0	**541**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	73	71	**375**
Potential Infiltration (I)	26	22	24	17	3	0	0	0	0	0	29	28	150
Potential Direct Surface Water Runoff (R)	39	33	37	25	5	0	0	0	0	0	44	43	225
Potential Infiltration (mm)	0	0	0	118	3	0	0	0	0	0	29	0	150
Pervious Evapotranspiration (m^3)	0	0	0	141	324	464	494	408	321	155	39	0	2,345
Pervious Runoff (m^3)	170	143	159	109	20	0	0	0	0	0	191	185	**976**
Pervious Infiltration (m^3)	0	0	0	510	13	0	0	0	0	0	127	0	**651**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Catchment 101						
Pre-Development Infiltration (INF)	1,977	m^3/yr	175	mm/yr	0.1	L/s
Pre-Development Runoff (R)	2,120	m^3/yr	188	mm/yr	0.1	L/s
Pre-Development Evapotranspiration (ET)	6,242	m^3/yr	553	mm/yr	0.2	L/s
Total = INF + R + ET	10,340	m^3/yr	916	mm/yr	0.3	L/s
Precipitation	10,340	m^3/yr	916	mm/yr	0.3	L/s

Sub-Area Descriptions (topography, soils, cover)	
Sub-Area A	Hilly, Fine Sandy to Silt Loam, Mature Forest
Sub-Area B	Hilly, Fine Sandy to Silt Loam, Pasture and Shrubs
Sub-Area C	Hilly, Fine Sandy to Silt Loam, Urban Lawn

Notes:

† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2020. Canadian Climate Normals 1981-2010, Waterloo Wellington A Station, Climate ID 6149387. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed March 30, 2020.

Assumptions:

[1] The monthly average precipitation collected at the Waterloo Wellington A climate station is reflective of the precipitation trends that have historically occurred at the Site.
[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.
[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.
[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).
[5] Soil moisture capacity is at a maximum in April.

TABLE 8 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
CATCHMENT 102

Pre-Development

Model Type: Thornthwaite and Mather (1955)
Client: Tricar Developments Inc.
Location **Catchment 102 (Lands Draining to Torrance Creek Subwatershed)**
Total Site Area (ha) 1.73

Land Description Factors (Sub-area descriptions provided below)	**Sub-Area A**	**Sub-Area B**	**Sub-Area C**										**Total**
Topography	0.10	0.10	0.10										
Soils	0.25	0.25	0.25										
Cover	0.20	0.15	0.05										
Sum (Infiltration Factor)[†]	0.55	0.50	0.40										
Soil Moisture Capacity (mm)	300	150	75										
Site area (ha)	0.98	0.72	0.03										1.73
Imperviousness Coefficient	0.00	0.00	0.00										
Impervious Area (ha)	0.00	0.00	0.00										0.00
Percentage of Total Site Area	0.0%	0.0%	0.0%										0%
Remaining Pervious Area (ha)	0.98	0.72	0.03										1.73
Total Pervious Site Area (ha)	0.98	0.72	0.03										1.73
Percentage of Total Site Area	56.7%	41.6%	1.6%										100%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Waterloo Wellington A Climate Normals, 1981 - 2010)[‡]													
Average Daily Temperature (°C)	-6.5	-5.5	-1	6.2	12.5	17.6	20	18.9	14.5	8.2	2.5	-3.3	**7.0**
Precipitation (mm)	65.2	54.9	61	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	**916**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.4	4.0	6.7	8.2	7.5	5.0	2.1	0.4	0.0	**35**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	29.0	60.8	87.2	99.8	94.0	71.1	39.0	11.1	0.0	**492**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET)(mm)	0	0	0	32	75	112	126	110	74	36	9	0	**573**
Precipitation - PET (mm)	65.2	54.9	61.0	42.0	7.6	-29.7	-27.0	-25.6	13.7	31.6	78.1	71.2	**343**
	0	0	0	100	100	100	100	100	100	100	100	0	

Evapotranspiration Analysis													
Sub-Area A	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	640	539	598	731	807	808	967	823	861	661	855	699	**8,990**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-65	-28	0	0	
Storage (S)	300	300	300	300	300	272	248	228	242	273	300	300	
Change in Storage	0	0	0	0	0	-28	-23	-20	14	32	27	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	111	122	104	74	36	9	0	**563**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	51	71	**353**
Potential Infiltration (I)	36	30	34	23	4	0	0	0	0	0	28	39	194
Potential Direct Surface Water Runoff (R)	29	25	27	19	3	0	0	0	0	0	23	32	159
Potential Infiltration (mm)	0	0	0	162	4	0	0	0	0	0	28	0	194
Pervious Evapotranspiration (m^3)	0	0	0	319	733	1086	1197	1023	727	351	88	0	5,524
Pervious Runoff (m^3)	288	242	269	186	34	0	0	0	0	0	227	314	**1,560**
Pervious Infiltration (m^3)	0	0	0	1588	41	0	0	0	0	0	277	0	**1,906**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE 8 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
CATCHMENT 102

Evapotranspiration Analysis													
Sub-Area B	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	469	395	439	536	593	593	710	604	632	485	627	513	**6,597**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-60	-19	0	0	
Storage (S)	150	150	150	150	150	123	103	87	100	132	150	150	
Change in Storage	0	0	0	0	0	-27	-20	-16	14	32	18	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	109	119	100	74	36	9	0	**554**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	60	71	**362**
Potential Infiltration (I)	33	27	31	21	4	0	0	0	0	0	30	36	181
Potential Direct Surface Water Runoff (R)	33	27	31	21	4	0	0	0	0	0	30	36	181
Potential Infiltration (mm)	0	0	0	147	4	0	0	0	0	0	30	0	181
Pervious Evapotranspiration (m^3)	0	0	0	234	538	787	856	720	534	258	65	0	3,991
Pervious Runoff (m^3)	235	198	220	151	27	0	0	0	0	0	216	256	**1,303**
Pervious Infiltration (m^3)	0	0	0	1060	27	0	0	0	0	0	216	0	**1,303**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Evapotranspiration Analysis													
Sub-Area C	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)	18	16	17	21	23	23	28	24	25	19	25	20	**259**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-50	-5	0	0	
Storage (S)	75	75	75	75	75	50	35	25	39	70	75	75	
Change in Storage	0	0	0	0	0	-25	-15	-10	14	32	5	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	107	114	94	74	36	9	0	**541**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	73	71	**375**
Potential Infiltration (I)	26	22	24	17	3	0	0	0	0	0	29	28	150
Potential Direct Surface Water Runoff (R)	39	33	37	25	5	0	0	0	0	0	44	43	225
Potential Infiltration (mm)	0	0	0	118	3	0	0	0	0	0	29	0	150
Pervious Evapotranspiration (m^3)	0	0	0	9	21	30	32	27	21	10	3	0	153
Pervious Runoff (m^3)	11	9	10	7	1	0	0	0	0	0	12	12	**64**
Pervious Infiltration (m^3)	0	0	0	33	1	0	0	0	0	0	8	0	**42**
Potential Impervious Evaporation (mm)	7	5	6	7	8	8	10	8	9	7	9	7	92
Potential Impervious Runoff (mm)	59	49	55	67	74	74	89	76	79	61	78	64	825
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Catchment 102

Pre-Development Infiltration (INF)	3,252	m^3/yr	188	mm/yr	0.1	L/s
Pre-Development Runoff (R)	2,926	m^3/yr	169	mm/yr	0.1	L/s
Pre-Development Evapotranspiration (ET)	9,668	m^3/yr	559	mm/yr	0.3	L/s
Total = INF + R + ET	15,846	m^3/yr	916	mm/yr	0.5	L/s
Precipitation	15,846	m^3/yr	916	mm/yr	0.5	L/s

Sub-Area Descriptions (topography, soils, cover)	
Sub-Area A	Hilly, Fine Sandy to Silt Loam, Mature Forest
Sub-Area B	Hilly, Fine Sandy to Silt Loam, Pasture and Shrubs
Sub-Area C	Hilly, Fine Sandy to Silt Loam, Urban Lawn

Notes:

† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2020. Canadian Climate Normals 1981-2010, Waterloo Wellington A Station, Climate ID 6149387. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed March 30, 2020.

Assumptions:

[1] The monthly average precipitation collected at the Waterloo Wellington A climate station is reflective of the precipitation trends that have historically occurred at the Site.
[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.
[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.
[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).
[5] Soil moisture capacity is at a maximum in April.

TABLE 9
1981 TO 2010 CANADIAN CLIMATE NORMALS (WATERLOO WELLINGTON A)

Climate Normals 1981-2010 Station Data
Metadata including Station Name, Province, Latitude, Longitude, Elevation, Climate ID, WMO ID, TC ID

STATION_NAME	PROVINCE	LATITUDE	LONGITUDE	ELEVATION	CLIMATE_ID	WMO_ID	TC_ID
WATERLOO WELLINGTON A	ON	43°27'00.000" N	80°23'00.000" W	317.0 m	6149387		

Legend
A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation)
B = At least 25 years
C = At least 20 years
D = At least 15 years

1981 to 2010 Canadian Climate Normals Station Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Temperature														
Daily Average (°C)	-6.5	-5.5	-1	6.2	12.5	17.6	20	18.9	14.5	8.2	2.5	-3.3	7	C
Standard Deviation	2.9	2.5	2	1.4	2.1	1.3	1.3	1.3	1.2	1.4	1.5	2.9	0.9	C
Daily Maximum (°C)	-2.6	-1.2	3.6	11.5	18.5	23.6	26	24.8	20.4	13.5	6.3	0.2	12	C
Daily Minimum (°C)	-10.3	-9.7	-5.6	0.8	6.4	11.5	14	12.9	8.6	2.9	-1.4	-6.8	2	C
Extreme Maximum (°C)	14.2	13.7	24.4	29.2	32	36.1	36	36.5	33.3	29.4	21.7	18.7		
Date (yyyy/dd)	1995/14	2000/26	2000/08	1990/25	1987/28	1988/25	1988/07	2001/08	1973/03	1971/02	1974/01	1982/03		
Extreme Minimum (°C)	-31.9	-29.2	-25.4	-16.1	-3.9	-0.6	5	1.1	-3.7	-8.3	-15.4	-27.2		
Date (yyyy/dd)	1984/16	1979/18	1980/02	1972/08	1970/07	1972/11	1971/03	1982/29	1989/27	1976/27	2000/23	1980/25		
Precipitation														
Rainfall (mm)	28.7	29.7	36.8	68	81.8	82.4	98.6	83.9	87.8	66.1	75	38	776.8	C
Snowfall (cm)	43.7	30.3	26.5	7.3	0.4	0	0	0	0	1.4	13	37.2	159.7	C
Precipitation (mm)	65.2	54.9	61	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	916.5	C
Average Snow Depth (cm)	11	11	6	0	0	0	0	0	0	0	1	5	3	C
Median Snow Depth (cm)	11	11	4	0	0	0	0	0	0	0	0	3	3	C
Snow Depth at Month-end (cm)	12	9	1	0	0	0	0	0	0	0	1	9	3	C
Extreme Daily Rainfall (mm)	43	47	36.8	53.4	51.8	54.2	89.8	73.7	74.4	39.2	56	36.8		
Date (yyyy/dd)	1995/15	2001/09	1991/27	1992/16	1996/20	1984/17	1985/15	1975/24	1986/10	1977/08	1992/12	1990/29		
Extreme Daily Snowfall (cm)	16.8	17.8	21.2	22.9	6	0	0	0	0	6	16.6	22.4		
Date (yyyy/dd)	1992/14	1985/12	1980/08	2002/02	1984/13	1970/01	1970/01	1970/01	1970/01	1997/26	1986/20	1971/30		
Extreme Daily Precipitation (mm)	43	47	53.8	53.4	51.8	54.2	89.8	73.7	74.4	39.2	56	36.8		
Date (yyyy/dd)	1995/15	2001/09	1976/02	1992/16	1996/20	1984/17	1985/15	1975/24	1986/10	1977/08	1992/12	1990/29		
Extreme Snow Depth (cm)	58	74	77	18	0	0	0	0	0	2	19	50		
Date (yyyy/dd)	1976/24	1982/14	1982/10	1975/04	1970/01	1970/01	1970/01	1970/01	1970/01	1989/21	1986/21	2000/31		
Days with Maximum Temperature														
<= 0 °C	20.7	15.7	9.2	0.64	0	0	0	0	0	0	3.2	14	63.5	C
> 0 °C	10.3	12.5	21.8	29.4	31	30	31	31	30	31	26.8	17	301.7	C
> 10 °C	0.45	0.5	4.9	17.3	29.3	29.9	31	31	29.6	22.5	7.4	1.6	205.4	C
> 20 °C	0	0	0.29	2.9	11.6	23.5	29.7	28.1	15.9	3.6	0.15	0	115.7	C
> 30 °C	0	0	0	0	0.32	2.1	3.6	1.9	0.45	0	0	0	8.4	C
> 35 °C	0	0	0	0	0	0.05	0.23	0.05	0	0	0	0	0.33	C
Days with Minimum Temperature														
> 0 °C	1.5	1.9	4	15.5	28.9	30	31	31	29.2	21.7	10.4	2.5	207.6	C
<= 2 °C	30.5	27.9	29.2	19.6	6.1	0.23	0	0.09	2.6	14.6	24.2	29.8	184.7	C
<= 0 °C	29.5	26.4	27	14.5	2.1	0	0	0	0.77	9.3	19.7	28.5	157.6	C
< -2 °C	27.2	23.6	21.9	8.3	0.18	0	0	0	0.18	3.8	13.1	23.1	121.3	C
< -10 °C	15.1	13.4	6.7	0.18	0	0	0	0	0	0	0.85	9.1	45.4	C
< -20 °C	2.9	2	0.41	0	0	0	0	0	0	0	0	0.67	6	C
< - 30 °C	0.05	0	0	0	0	0	0	0	0	0	0	0	0.05	C
Days with Rainfall														
>= 0.2 mm	5.6	5	6.9	11.5	12.4	12	10.6	10.7	12.2	13.7	11.6	6.9	118.7	C
>= 5 mm	1.8	1.8	2.5	4.1	5.1	5.2	5.1	4.4	5	4.4	4.7	2.8	46.9	C
>= 10 mm	0.95	1	1.4	2.1	2.9	3.1	3.4	2.8	2.8	2.4	2.4	1.2	26.4	C
>= 25 mm	0.09	0.14	0.09	0.32	0.45	0.36	0.95	0.77	0.68	0.14	0.48	0.14	4.6	C
Days With Snowfall														
>= 0.2 cm	16.1	11.9	9	3.3	0.18	0	0	0	0	0.91	6.5	14.4	62.2	C
>= 5 cm	2.5	1.8	1.9	0.36	0.05	0	0	0	0	0.05	0.67	2.3	9.6	C
>= 10 cm	0.64	0.5	0.64	0.09	0	0	0	0	0	0	0.05	0.57	2.5	C
>= 25 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	C
Days with Precipitation														
>= 0.2 mm	18.2	14.2	13.8	13.7	12.4	12	10.6	10.7	12.2	13.9	16.4	18.1	166	C
>= 5 mm	4.3	3.2	4	4.5	5.2	5.2	5.1	4.4	5	4.5	5.3	4.5	55.1	C
>= 10 mm	1.5	1.6	1.8	2.3	2.9	3.1	3.4	2.8	2.8	2.4	2.5	2.1	29.2	C
>= 25 mm	0.09	0.18	0.27	0.32	0.45	0.36	0.95	0.77	0.68	0.14	0.48	0.38	5.1	C
Days with Snow Depth														
>= 1 cm	26.9	24.3	17.2	1.7	0	0	0	0	0	0.18	5.6	19.4	95.3	C
>= 5 cm	20.6	17.5	9.7	0.41	0	0	0	0	0	0	1.1	10.5	59.8	C
>= 10 cm	13.7	11.2	6.5	0.05	0	0	0	0	0	0	0.33	4.5	36.2	C
>= 20 cm	6.8	5.1	1.5	0	0	0	0	0	0	0	0	1.4	14.7	C
Wind														
Speed (km/h)	15.2	14.3	14.9	14.6	12.3	10.4	9.6	8.5	9.8	11.7	14.5	14.8	12.6	C
Most Frequent Direction	W	W	W	NW	NW	NW	NW	NW	NW	W	W	SW	W	C
Maximum Hourly Speed (km/h)	70	67	74	72	71	52	52	45	53	63	66	61	74	

TABLE 9
1981 TO 2010 CANADIAN CLIMATE NORMALS (WATERLOO WELLINGTON A)

Date (yyyy/dd)	1982/04	2002/01	2002/09	1984/30	1976/05	1998/02	2001/01	1966/09	1967/26	2001/26	1975/10	1972/13	2002/09	
Direction of Maximum Hourly Speed	SW	W	W	S	SW	W	NW	W	S	SW	SW	SW	W	
Maximum Gust Speed (km/h)	113	113	120	98	106	89	111	98	89	96	100	96	120	
Date (yyyy/dd)	1978/26	2002/01	1981/30	1984/30	1976/05	1998/02	1997/14	1990/27	1997/29	2001/25	1998/11	1982/28	1981/30	
Direction of Maximum Gust	S	W	SW	SW	SW	W	W	N	W	SW	SW	SW	SW	
Days with Winds >= 52 km/h														
Days with Winds >= 63 km/h														
Degree Days														
Above 24 °C	0	0	0	0	0.1	1.6	5.2	2.5	0.3	0	0	0	9.8	C
Above 18 °C	0	0	0	1	10.2	40.9	77.2	54.7	16.6	0.7	0	0	201.4	C
Above 15 °C	0	0	0.1	3.7	30.2	94.1	157.3	125	46.3	4.5	0	0	461.2	C
Above 10 °C	0	0	2.3	20.3	103.6	227.6	310.8	275.6	145.8	33	3.8	0.6	1123.2	C
Above 5 °C	1.2	0.9	13.4	75.1	234.7	376.8	465.8	430.5	286.4	115.6	28.1	5	2033.3	C
Above 0 °C	11	13.9	55.4	190.6	388.6	526.8	620.8	585.5	436.2	255.6	100.1	26.1	3210.6	C
Below 0 °C	211.7	168	89.7	6.1	0	0	0	0	0	0.2	23.6	129.4	628.8	C
Below 5 °C	356.8	296.1	202.7	40.7	1.1	0	0	0	0.1	15.2	101.7	263.3	1277.6	C
Below 10 °C	510.7	436.4	346.7	135.8	25	0.8	0	0.2	9.6	87.5	227.3	413.8	2193.7	C
Below 15 °C	665.7	577.5	499.4	269.3	106.6	17.2	1.5	4.6	60.1	214.1	373.6	568.3	3357.8	C
Below 18 °C	758.7	662.2	592.4	356.6	179.7	54	14.4	27.2	120.4	303.3	463.6	661.3	4193.6	C
Humidex														
Extreme Humidex	13.4	13	28	33.7	39.6	43.2	47.7	48.3	41.2	34.5	24.4	22.1		
Date (yyyy/dd)	1995/14	1997/21	1998/30	2002/16	1987/30	1988/25	1995/14	1988/02	1983/10	1971/02	1987/03	1982/03		
Wind Chill														
Extreme Wind Chill	-40.5	-37.1	-30.2	-20.6	-8.1	0	0	0	-4.1	-11.9	-22.2	-31.2		
Date (yyyy/dd)	1982/17	1979/17	1989/07	1982/04	1978/01	1966/13	1966/01	1966/01	1989/27	1969/23	1976/29	1983/26		
Humidity														
Average Relative Humidity - 0600LST (%)	86.4	83.4	84.8	84.4	84.7	87	90.1	93.6	94.3	90.6	87.6	87.1	87.8	D
Average Relative Humidity - 1500LST (%)	78.2	75.4							66.5	69.7		81.7		

1981 to 2010 Canadian Climate Normals station data (Frost-Free)							
	Frost-Free:	Code					
Average Date of Last Spring Frost	7-May	D					
Average Date of First Fall Frost	2-Oct	D					
Average Length of Frost-Free Period	147 Days	D					
Probability of last temperature in spring of 0 °C or lower c	10%	25%	33%	50%	66%	75%	90%
Date	18-May	15-May	13-May	8-May	4-May	30-Apr	28-Apr
Probability of first temperature in fall of 0 °C or lower on c	10%	25%	33%	50%	66%	75%	90%
Date	19-Sep	24-Sep	25-Sep	30-Sep	3-Oct	8-Oct	16-Oct
Probability of frost-free period equal to or less than indica	10%	25%	33%	50%	66%	75%	90%
Days	128	135	136	144	152	157	169

Source: Environment Canada, 2020. Canadian Climate Normals 1981-2010. Online [http://climate.weather.gc.ca/climate_normals/index_e.html] Last Accessed February 2018

TABLE 10 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
FORMER CATCHMENT 101

Post-Development
Model Type: Thornthwaite and Mather (1955)
Client: Tricar Developments Inc.
Location Former Catchment 101 (Lands Draining to Upper Hanlon Creek Watershed)
Total Site Area (ha) 1.13

Land Description Factors (Sub-area descriptions provided below)	**Sub-Area A**	**Sub-Area B**	**Sub-Area C**										**Total**
Topography	0.10	0.10	0.10										
Soils	0.25	0.25	0.25										
Cover	0.05	0.05	0.05										
Sum (Infiltration Factor)†	0.40	0.40	0.40										
Soil Moisture Capacity (mm)	300	150	75										
Site area (ha)	0.52	0.18	0.43										1.13
Imperviousness Coefficient	0.86	0.89	0.89										
Impervious Area (ha)	0.44	0.16	0.38										0.99
Percentage of Total Site Area	39.4%	14.1%	34.1%										87.6%
Remaining Pervious Area (ha)	0.07	0.02	0.05										0.14
Total Pervious Site Area (ha)	0.07	0.02	0.05										0.14
Percentage of Total Site Area	6.3%	1.7%	4.4%										12.4%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Hamilton A Climate Normals, 1981 - 2010)‡													
Average Daily Temperature (°C)	-6.5	-5.5	-1	6.2	12.5	17.6	20	18.9	14.5	8.2	2.5	-3.3	**7.0**
Precipitation (mm)	65.2	54.9	61	74.5	82.3	82.4	98.6	83.9	87.8	67.4	87.1	71.2	**916**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.4	4.0	6.7	8.2	7.5	5.0	2.1	0.4	0.0	**35**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	29.0	60.8	87.2	99.8	94.0	71.1	39.0	11.1	0.0	**492**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET)(mm)	0	0	0	32	75	112	126	110	74	36	9	0	**573**
Precipitation - PET (mm)	65	55	61	42	8	-30	-27	-26	14	32	78	71	**343**

Evapotranspiration Analysis **Sub-Area A**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**4,728**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-65	-28	0	0	
Storage (S)	300	300	300	300	300	272	248	228	242	273	300	300	
Change in Storage	0	0	0	0	0	-28	-23	-20	14	32	27	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	111	122	104	74	36	9	0	563
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	51	71	**353**
Potential Infiltration (I)	26	22	24	17	3	0	0	0	0	0	21	28	141
Potential Direct Surface Water Runoff (R)	39	33	37	25	5	0	0	0	0	0	31	43	212
Potential Infiltration (mm)	0	0	0	118	3	0	0	0	0	0	21	0	141
Pervious Evapotranspiration (m^3)	0	0	0	23	53	79	87	74	53	26	6	0	402
Pervious Runoff (m^3)	28	24	26	18	3	0	0	0	0	0	22	31	**151**
Pervious Infiltration (m^3)	0	0	0	84	2	0	0	0	0	0	15	0	**101**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	65	55	61	75	82	82	99	84	88	67	87	71	916
Impervious Runoff (m^3)	290	244	271	331	366	366	438	373	390	300	387	316	**4,073**

TABLE 10 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
FORMER CATCHMENT 101

Evapotranspiration Analysis													
Sub-Area B	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**1,640**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-60	-19	0	0	
Storage (S)	150	150	150	150	150	123	103	87	100	132	150	150	
Change in Storage	0	0	0	0	0	-27	-20	-16	14	32	18	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	109	119	100	74	36	9	0	**554**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	60	71	**362**
Potential Infiltration (I)	26	22	24	17	3	0	0	0	0	0	24	28	145
Potential Direct Surface Water Runoff (R)	39	33	37	25	5	0	0	0	0	0	36	43	217
Potential Infiltration (mm)	0	0	0	118	3	0	0	0	0	0	24	0	145
Pervious Evapotranspiration (m^3)	0	0	0	6	15	22	23	20	15	7	2	0	109
Pervious Runoff (m^3)	8	6	7	5	1	0	0	0	0	0	7	8	**43**
Pervious Infiltration (m^3)	0	0	0	23	1	0	0	0	0	0	5	0	**28**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	65	55	61	75	82	82	99	84	88	67	87	71	916
Impervious Runoff (m^3)	104	87	97	119	131	131	157	134	140	107	139	113	**1,460**

Evapotranspiration Analysis													
Sub-Area C	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**3,972**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-30	-57	-82	-50	-5	0	0	
Storage (S)	75	75	75	75	75	50	35	25	39	70	75	75	
Change in Storage	0	0	0	0	0	-25	-15	-10	14	32	5	0	
Actual Evapotranspiration (mm)	0	0	0	32	75	107	114	94	74	36	9	0	**541**
Recharge/Runoff Analysis													
Water Surplus (mm)	65	55	61	42	8	0	0	0	0	0	73	71	**375**
Potential Infiltration (I)	26	22	24	17	3	0	0	0	0	0	29	28	150
Potential Direct Surface Water Runoff (R)	39	33	37	25	5	0	0	0	0	0	44	43	225
Potential Infiltration (mm)	0	0	0	118	3	0	0	0	0	0	29	0	150
Pervious Evapotranspiration (m^3)	0	0	0	16	37	53	56	46	36	18	4	0	266
Pervious Runoff (m^3)	19	16	18	12	2	0	0	0	0	0	22	21	**111**
Pervious Infiltration (m^3)	0	0	0	58	1	0	0	0	0	0	14	0	**74**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	65	55	61	75	82	82	99	84	88	67	87	71	916
Impervious Runoff (m^3)	251	211	234	286	316	317	379	322	337	259	335	274	**3,522**

Former Catchment 101

Post-Development Infiltration (INF)	203	m^3/yr	18	mm/yr	0.0	L/s
Post-Development Runoff (R)	9,359	m^3/yr	829	mm/yr	0.3	L/s
Post-Development Evapotranspiration (ET)	777	m^3/yr	69	mm/yr	0.0	L/s
Total = INF + R + ET	10,340	m^3/yr	916	mm/yr	0.3	L/s
Precipitation	10,340	m^3/yr	916	mm/yr	0.3	L/s

Pre-Development Infiltration	1,977	m^3/yr
Infiltration Deficit	**-1,774**	**m^3/yr**

Sub-Area Descriptions (topography, soils, cover)	
Sub-Area A	Hilly, Fine Sandy to Silt Loam, Mature Forest
Sub-Area B	Hilly, Fine Sandy to Silt Loam, Pasture and Shrubs
Sub-Area C	Hilly, Fine Sandy to Silt Loam, Urban Lawn

Notes:

† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2020. Canadian Climate Normals 1981-2010, Waterloo Wellington A Station, Climate ID 6149387. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed March 30, 2020.

Assumptions:
[1] The monthly average precipitation collected at the Waterloo Wellington A climate station is reflective of the precipitation trends that have historically occurred at the Site.
[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.
[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.
[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).
[5] Soil moisture capacity is at a maximum in April.

TABLE 11 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
FORMER CATCHMENT 102

Post-Development

Model Type: Thornthwaite and Mather (1955)
Client: Tricar Developments Inc.
Location **Former Catchment 102 (Lands Draining to Torrance Creek Subwatershed)**
Total Site Area (ha) 1.73

Land Description Factors (Sub-area descriptions provided below)	**Sub-Area A**	**Sub-Area B**	**Sub-Area C**	**Total**
Topography	0.10	0.10	0.10	
Soils	0.25	0.25	0.25	
Cover	0.20	0.15	0.05	
Sum (Infiltration Factor)†	0.55	0.50	0.40	
Soil Moisture Capacity (mm)	300	150	75	
Site area (ha)	0.98	0.72	0.03	1.73
Imperviousness Coefficient	0.15	0.20	0.03	
Impervious Area (ha)	0.15	0.14	0.00	0.29
Percentage of Total Site Area	8.5%	8.3%	0.0%	16.9%
Remaining Pervious Area (ha)	0.83	0.58	0.03	1.44
Total Pervious Site Area (ha)	0.83	0.58	0.03	1.44
Percentage of Total Site Area	48.2%	33.3%	1.6%	83.1%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Hamilton A Climate Normals, 1981 - 2010)‡													
Average Daily Temperature (°C)	-7.4	-6	-1.5	5.9	12.6	17.4	20	19.2	14.7	8.4	2	-4	**6.8**
Precipitation (mm)	60.7	48.5	50.7	70.4	88.3	93.3	72.8	96.7	100.2	84.6	89.6	64.7	**921**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.3	4.1	6.6	8.2	7.7	5.1	2.2	0.2	0.0	**35**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	27.5	61.3	86.1	99.8	95.6	72.1	39.9	8.8	0.0	**491**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET)(mm)	0	0	0	31	75	111	126	111	75	37	7	0	**572**
Precipitation - PET (mm)	61	49	51	40	13	-17	-53	-15	25	48	83	65	**348**

Evapotranspiration Analysis													
Sub-Area A	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**9,031**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-17	-70	-85	-53	-1	0	0	
Storage (S)	300	300	300	300	300	283	237	226	251	299	300	300	
Change in Storage	0	0	0	0	0	-17	-46	-11	25	48	1	0	
Actual Evapotranspiration (mm)	0	0	0	31	75	110	118	108	75	37	7	0	562
Recharge/Runoff Analysis													
Water Surplus (mm)	61	49	51	40	13	0	0	0	0	0	82	65	**359**
Potential Infiltration (I)	33	27	28	22	7	0	0	0	0	0	45	36	197
Potential Direct Surface Water Runoff (R)	27	22	23	18	6	0	0	0	0	0	37	29	162
Potential Infiltration (mm)	0	0	0	145	7	0	0	0	0	0	45	0	197
Pervious Evapotranspiration (m^3)	0	0	0	256	628	919	988	900	626	306	59	0	4,683
Pervious Runoff (m^3)	228	182	190	149	49	0	0	0	0	0	306	243	**1,347**
Pervious Infiltration (m^3)	0	0	0	1212	60	0	0	0	0	0	375	0	**1,646**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	61	49	51	70	88	93	73	97	100	85	90	65	921
Impervious Runoff (m^3)	89	71	75	104	130	137	107	142	147	124	132	95	**1,355**

TABLE 11 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS
FORMER CATCHMENT 102

Evapotranspiration Analysis													
Sub-Area B	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**6,627**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-17	-70	-85	-46	8	0	0	
Storage (S)	150	150	150	150	150	134	94	85	110	158	150	150	
Change in Storage	0	0	0	0	0	-16	-40	-9	25	48	-8	0	
Actual Evapotranspiration (mm)	0	0	0	31	75	110	112	105	75	37	7	0	**552**
Recharge/Runoff Analysis													
Water Surplus (mm)	61	49	51	40	13	0	0	0	0	0	91	65	**368**
Potential Infiltration (I)	30	24	25	20	7	0	0	0	0	0	45	32	184
Potential Direct Surface Water Runoff (R)	30	24	25	20	7	0	0	0	0	0	45	32	184
Potential Infiltration (mm)	0	0	0	132	7	0	0	0	0	0	45	0	184
Pervious Evapotranspiration (m^3)	0	0	0	177	433	632	647	607	433	211	41	0	3,182
Pervious Runoff (m^3)	175	140	146	114	38	0	0	0	0	0	261	186	**1,060**
Pervious Infiltration (m^3)	0	0	0	761	38	0	0	0	0	0	261	0	**1,060**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	61	49	51	70	88	93	73	97	100	85	90	65	921
Impervious Runoff (m^3)	87	70	73	101	127	134	105	139	144	122	129	93	**1,325**

Evapotranspiration Analysis													
Sub-Area C	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation (m^3)													**260**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-17	-70	-85	-31	19	0	0	
Storage (S)	75	75	75	75	75	59	29	24	49	97	75	75	
Change in Storage	0	0	0	0	0	-16	-30	-5	25	48	-22	0	
Actual Evapotranspiration (mm)	0	0	0	31	75	109	103	102	75	37	7	0	**538**
Recharge/Runoff Analysis													
Water Surplus (mm)	61	49	51	40	13	0	0	0	0	0	105	65	**382**
Potential Infiltration (I)	24	19	20	16	5	0	0	0	0	0	42	26	153
Potential Direct Surface Water Runoff (R)	36	29	30	24	8	0	0	0	0	0	63	39	229
Potential Infiltration (mm)	0	0	0	106	5	0	0	0	0	0	42	0	153
Pervious Evapotranspiration (m^3)	0	0	0	8	21	30	28	28	21	10	2	0	148
Pervious Runoff (m^3)	10	8	8	7	2	0	0	0	0	0	17	11	**63**
Pervious Infiltration (m^3)	0	0	0	29	1	0	0	0	0	0	11	0	**42**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	61	49	51	70	88	93	73	97	100	85	90	65	921
Impervious Runoff (m^3)	1	0	0	1	1	1	1	1	1	1	1	1	**8**

Former Catchment 102

Post-Development Infiltration (INF)	2,748	m^3/yr	159	mm/yr	0.1	L/s
Post-Development Runoff (R)	5,158	m^3/yr	298	mm/yr	0.2	L/s
Post-Development Evapotranspiration (ET)	8,012	m^3/yr	463	mm/yr	0.3	L/s
Total = INF + R + ET	15,918	m^3/yr	921	mm/yr	0.5	L/s
Precipitation	15,918	m^3/yr	921	mm/yr	0.5	L/s

Pre-Development Infiltration	3,252	m^3/yr
Infiltration Deficit	**-503**	**m^3/yr**

Sub-Area Descriptions (topography, soils, cover)	
Sub-Area A	Hilly, Fine Sandy to Silt Loam, Mature Forest
Sub-Area B	Hilly, Fine Sandy to Silt Loam, Pasture and Shrubs
Sub-Area C	Hilly, Fine Sandy to Silt Loam, Urban Lawn

Notes:

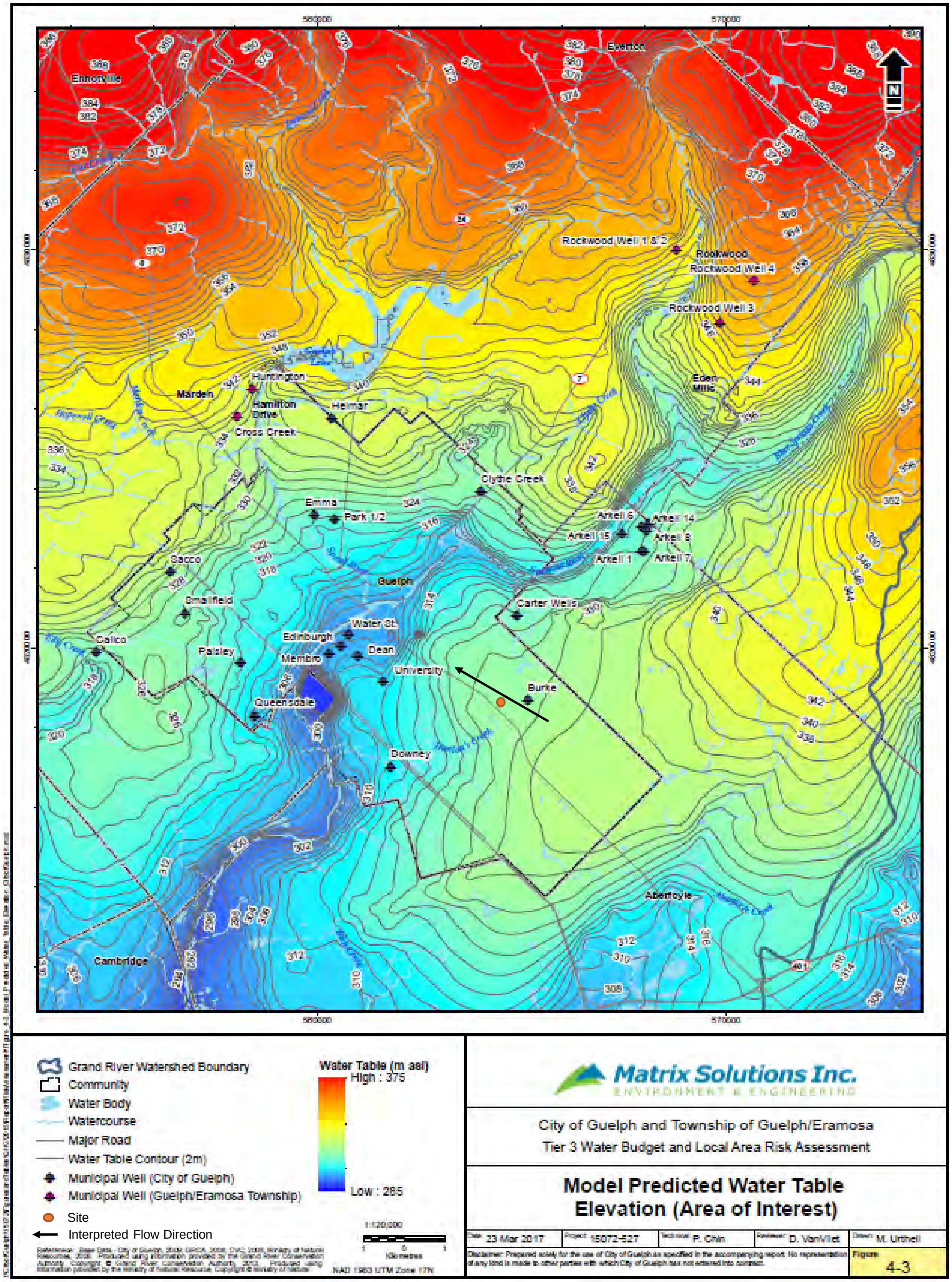
† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2016. Canadian Climate Normals 1981-2010, Burketon McLaughlin Station, Climate ID 6151042. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed January 4, 2016.

Assumptions:
[1] The monthly average precipitation collected at the Burketon McLaughlin climate station is reflective of the precipitation trends that have historically occurred at the Site.
[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.
[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.
[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).
[5] Soil moisture capacity is at a maximum in April.

APPENDIX C:
REGIONAL GROUNDWATER FLOW MAPPING



Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph and Township of Guelph/Eramosa
Tier 3 Water Budget and Local Area Risk Assessment

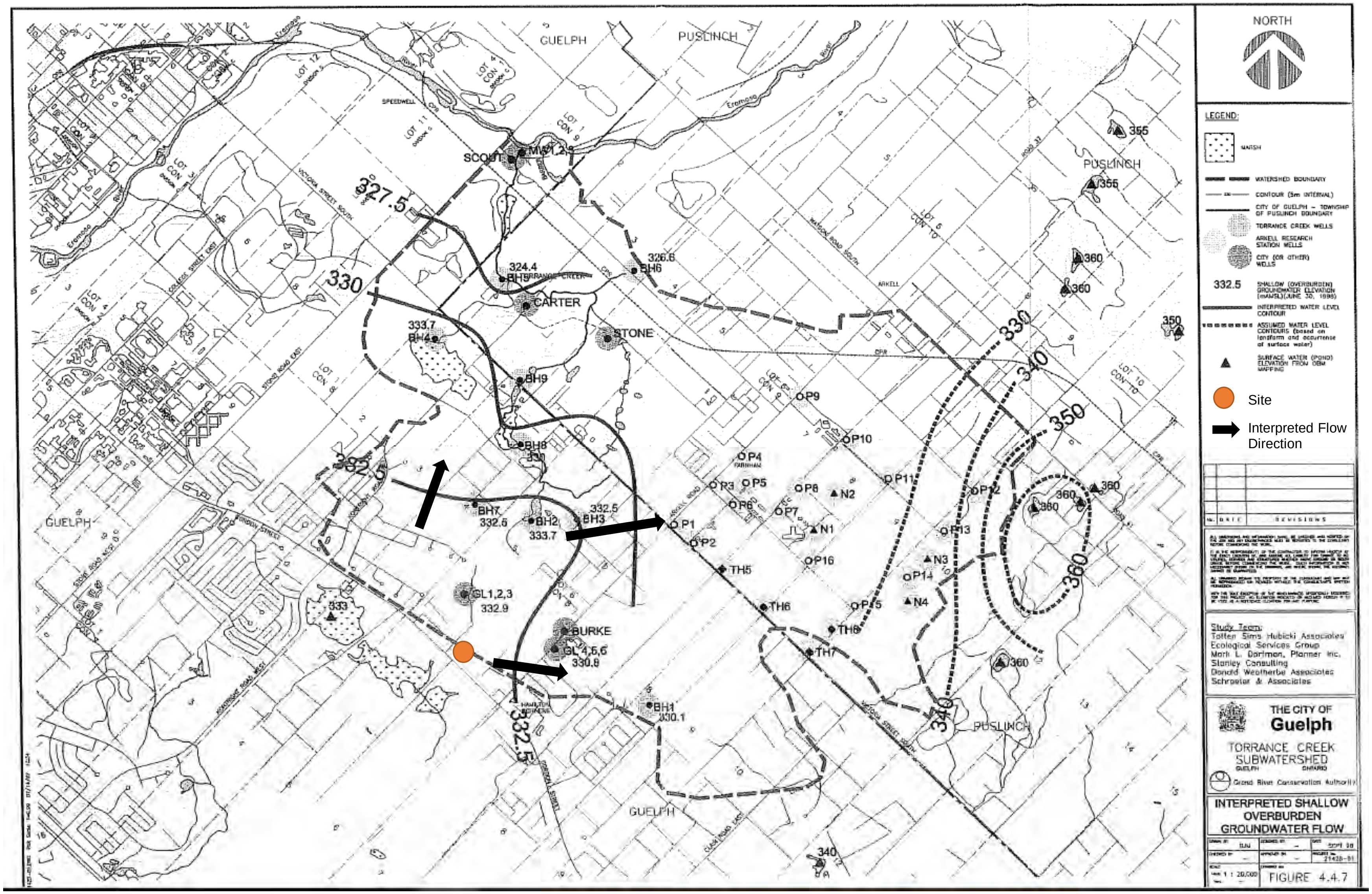
Model Predicted Water Table Elevation (Area of Interest)

Date: 23 Mar 2017	Project: 15072-527	Technical: P. Chin	Reviewer: D. VanVliet	Drawn: M. Urtheil

Disclaimer: Prepared solely for the use of City of Guelph as specified in the accompanying report. No representation of any kind is made to other parties with which City of Guelph has not entered into contract.

Figure 4-3

Source: Matrix Solutions Inc. 2017. City of Guelph and Township of Guelph/Eramosa Tier Three Water Budget and Local Area Risk Assessment.



<u>Source</u>: Totten Sims Hubicki Associates, Ecological Services Group, Ray Blackport, Mark L. Dorfman Planner Inc., Shroeter & Associates, and Donald G. Weatherbe Associates. 1998. Torrance Creek Subwatershed Study - Management Study. Prepared for City of Guelph and Grand River Conservation Authority, September 1998, September 1998, Revised November 1998.

APPENDIX D:
REGIONAL GROUNDWATER RECHARGE MAPPING

Grand River
Conservation Authority
Date: Jul 22, 2019

Hydraulic Gradient

Map Centre (UTM NAD83 z17): 564,582.48 4,818,656.58

This map is not to be used for navigation

Legend

- ☐ Municipal Boundary (GRCA)
- — Watercourse - Local (GRCA)
- — Contour 5m (ON)
- ☐ Park - Local (GRCA)
- ■ Waterbody - Local (GRCA)

Hydraulic Gradient (GRCA)

- 🟦 Upward
- ■ Downward

🟥 **Site Boundary (Approximate)**

Disclaimer: This map is for illustrative purposes only. Information contained herein is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.
The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to: https://maps.grandriver.ca/Sources-and-Citations.pdf

0 45 90 180 270 Metres

N

NAD 1983 UTM Zone 17N

Scale: 7,762

Grand River
Conservation Authority
Date: Jul 22, 2019

Average Annual Recharge

Map Centre (UTM NAD83 z17): 564,582.48 4,818,656.58

This map is not to be used for navigation

Legend

- ☐ Municipal Boundary (GRCA)
- — Watercourse - Local (GRCA)
- — Contour 5m (ON)
- ☐ Park - Local (GRCA)
- ■ Waterbody - Local (GRCA)

Average Annual Recharge (GRCA)

- ■ less than 50 mm/yr
- ■ 50 - 100
- ■ 100 - 200
- ■ 200 - 300
- ■ 300 - 400
- ■ > 400

☐ **Site Boundary (Approximate)**

The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to: https://maps.grandriver.ca/Sources-and-Citations.pdf

0 45 90 180 270 Metres

N

NAD 1983 UTM Zone 17N

Scale: 7,762

APPENDIX E:
BOREHOLE LOGS

ı-kell Rd. Well #2 · 2/10 · 6. № ~~1~~933 f · PW2/66(COG)

Burke Well

12 inch E

5 R N

5 R 1/1/0/0

The Ontario Water Resources Commission Act

WATER WELL RECORD

~~Corp.~~ City of Guelph Township, Village, Town or City

12/31 ~~Wellington~~ ~~or District~~

number 8 Lot number 6 Date completed 16th June 1966 - well, ~~20th~~ Aug 1966 - testing

Corporation of the City of Guelph (print in block letters) Address Guelph Ont.

Casing and Screen Record

ıside diameter of casing 12 inch

length of casing 64 ft 10 in.

ype of screen nil

ength of screen nil

De h to top of screen nil

Diameter of finished hole 12 inch

Pumping Test

Static level 10 ft. 332

Test-pumping rate 1000 G.P.M.

Pumping level 20 ft 11 inches

Duration of test pumping 24 hours

Water clear or cloudy at end of test clear

Recommended pumping rate 800 G.P.M.

with pump setting of 100 feet below ground surface

Well Log

Overburden and Bedrock Record	From 0 ft.	To 4 ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
black muck and gravel	4	24	136 ft	fresh
rough gravel	24	34		
sandy blue clay	34	55		
blue clay	55	64		
blue clay & gravel	64	95		
light brown rock	95	104		
dark brown rock	104	140		
dark brown & black rock	140	245		
dark grey rock	245	258		
dark blue rock	253	259		
blue shale				

r what purpose(s) is the water to be used? Corporation of the City of Guelph

; well on upland, in valley, or on hillside?

illing or Boring Firm Graham Well Drilling

ddress 119 Renfield St. Guelph Ont.

icence Number 2076

ame of Driller or Borer Arthur Titus

ddress Eramosa Rd. Guelph Ont.

ate Aug 31st 1966

J L Graham - per MCG

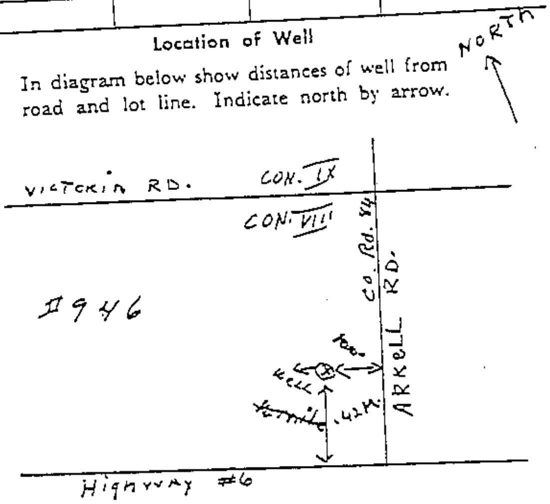
(Signature of Licensed Drilling or Boring Contractor)

orm 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



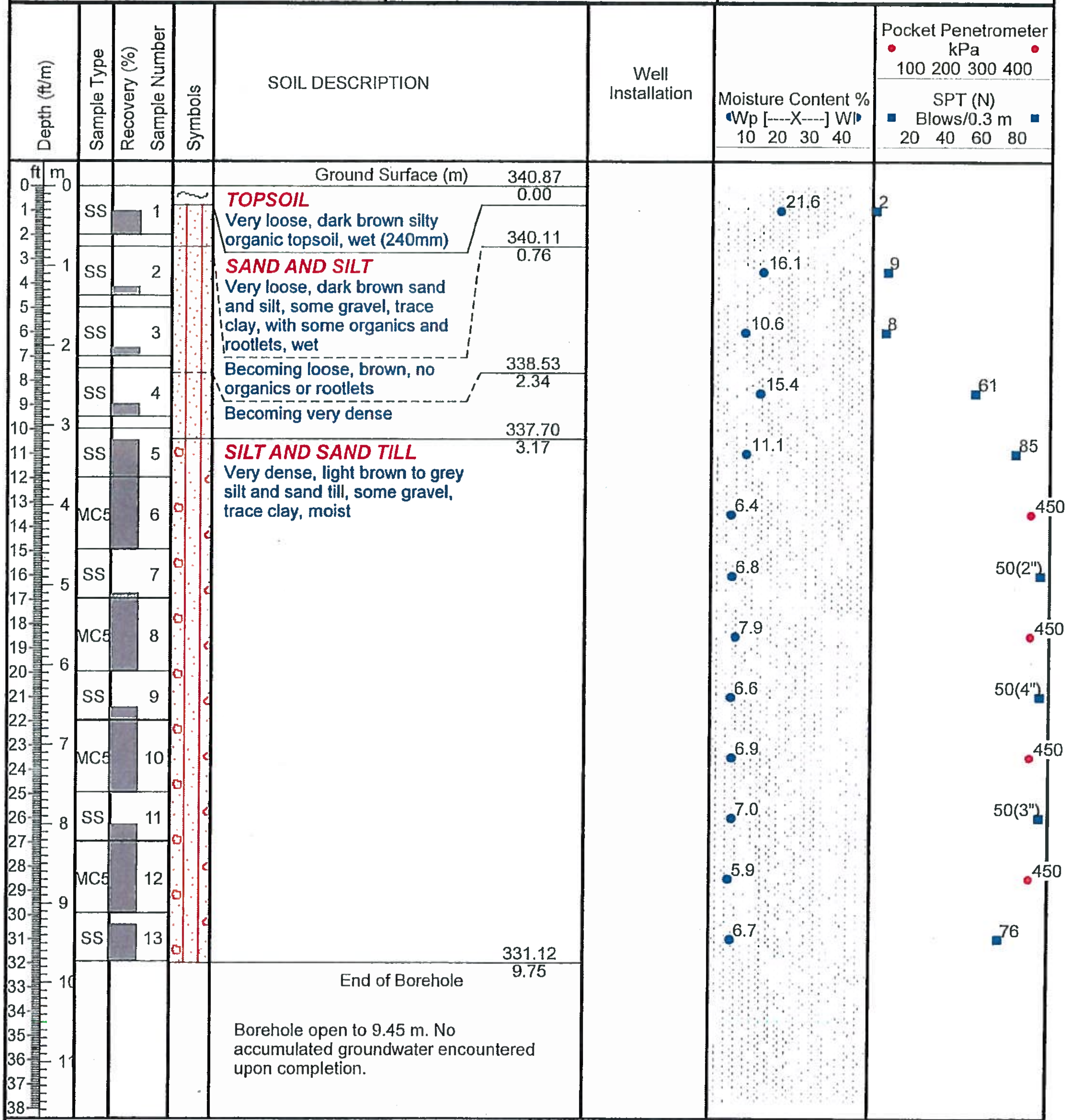
BOREHOLE 1

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.87 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Sample Type	Sample Number	Moisture Content %	SPT (N) / Pocket Penetrometer
SS	1	21.6	2
SS	2	16.1	9
SS	3	10.6	8
SS	4	15.4	61
SS	5	11.1	85
MC5	6	6.4	450
SS	7	6.8	50(2")
MC5	8	7.9	450
SS	9	6.6	50(4")
MC5	10	6.9	450
SS	11	7.0	50(3")
MC5	12	5.9	450
SS	13	6.7	76

Ground Surface (m) 340.87

0.00

TOPSOIL
Very loose, dark brown silty organic topsoil, wet (240mm)

340.11
0.76

SAND AND SILT
Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

338.53
2.34

Becoming loose, brown, no organics or rootlets

Becoming very dense

337.70
3.17

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist

331.12
9.75

End of Borehole

Borehole open to 9.45 m. No accumulated groundwater encountered upon completion.

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

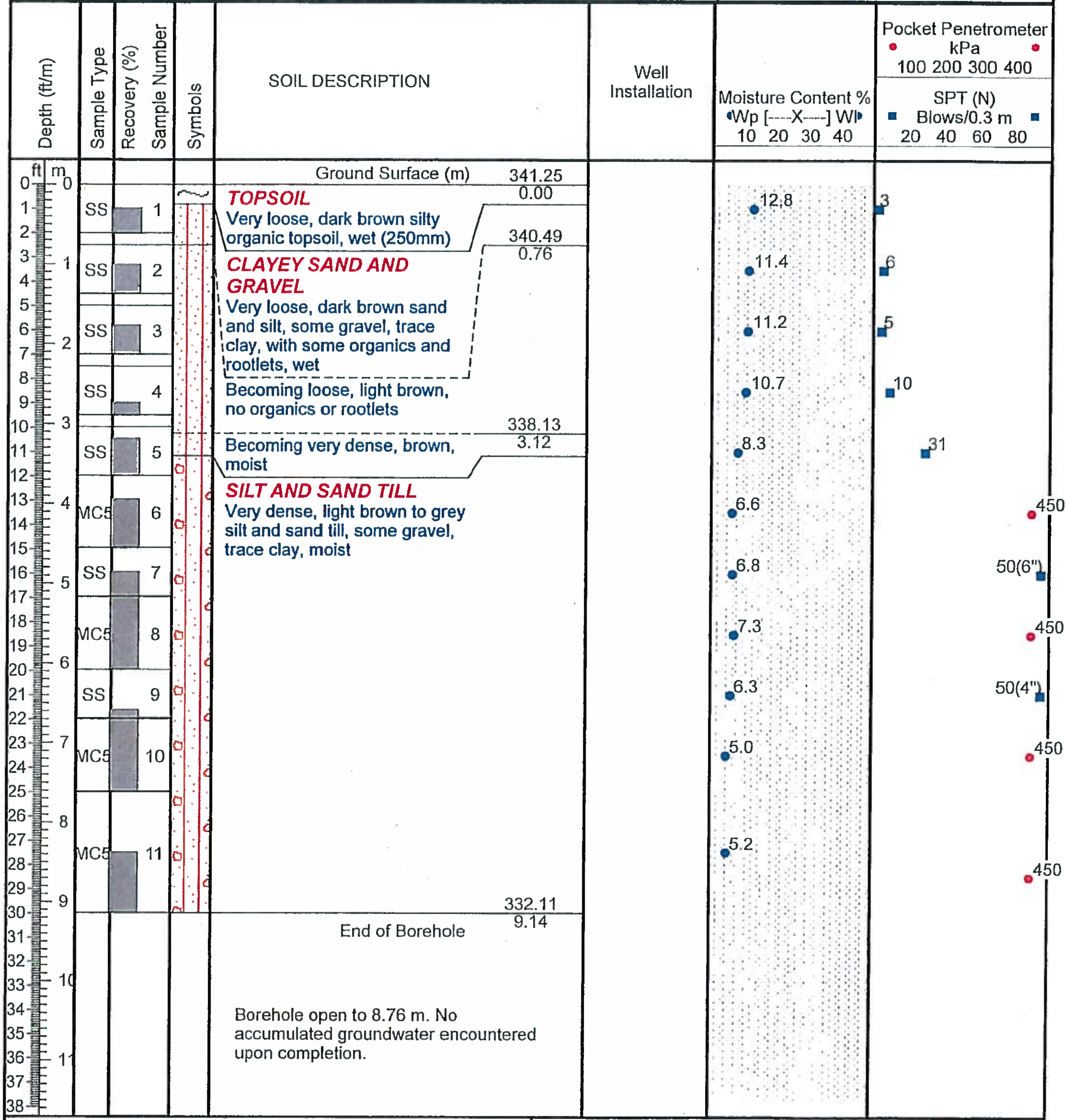
BOREHOLE 2

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 341.25 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m) 341.25 0.00

TOPSOIL
Very loose, dark brown silty organic topsoil, wet (250mm)

340.49 0.76

CLAYEY SAND AND GRAVEL
Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming loose, light brown, no organics or rootlets

338.13 3.12

Becoming very dense, brown, moist

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist

332.11 9.14

End of Borehole

Borehole open to 8.76 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	12.8	3	
SS	2	11.4	6	
SS	3	11.2	5	
SS	4	10.7	10	
SS	5	8.3	31	
MC5	6	6.6		450
SS	7	6.8	50(6")	
MC5	8	7.3		450
SS	9	6.3	50(4")	
MC5	10	5.0		450
MC5	11	5.2		450

BOREHOLE 3

Page 1 of 1

Date Drilled: April 17, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.76 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation	Moisture Content % ◂Wp [----X----] Wl▸ 10 20 30 40	Pocket Penetrometer ● kPa ● 100 200 300 400 SPT (N) ■ Blows/0.3 m ■ 20 40 60 80
					Ground Surface (m)	340.76 0.00			
	SS		1		***TOPSOIL*** Loose, dark brown silty organic topsoil, moist (240mm)			15.9	6
	SS		2		***SAND AND SILT*** Loose, dark brown sand and silt, some gravel, trace clay, wet			12.7	10
	SS		3					12.3	4
	SS		4		Becoming very dense, brown	338.17 2.59		7.7	18
	SS		5					8.3	82
	MC5		6		***SILT AND SAND TILL*** Very dense, light brown to grey silt and sand till, some gravel, trace clay, moist	337.10 3.66		6.9	450
	SS		7					6.2	50(3")
	MC5		8					6.8	450
	SS		9					7.3	50(4")
	MC5		10					8.3	450
	SS		11					6.5	50(3")
	MC5		12					7.4	50(2")
					End of Borehole	331.62 9.14			

Cave at 8.05 m. No accumulated groundwater encountered upon completion.

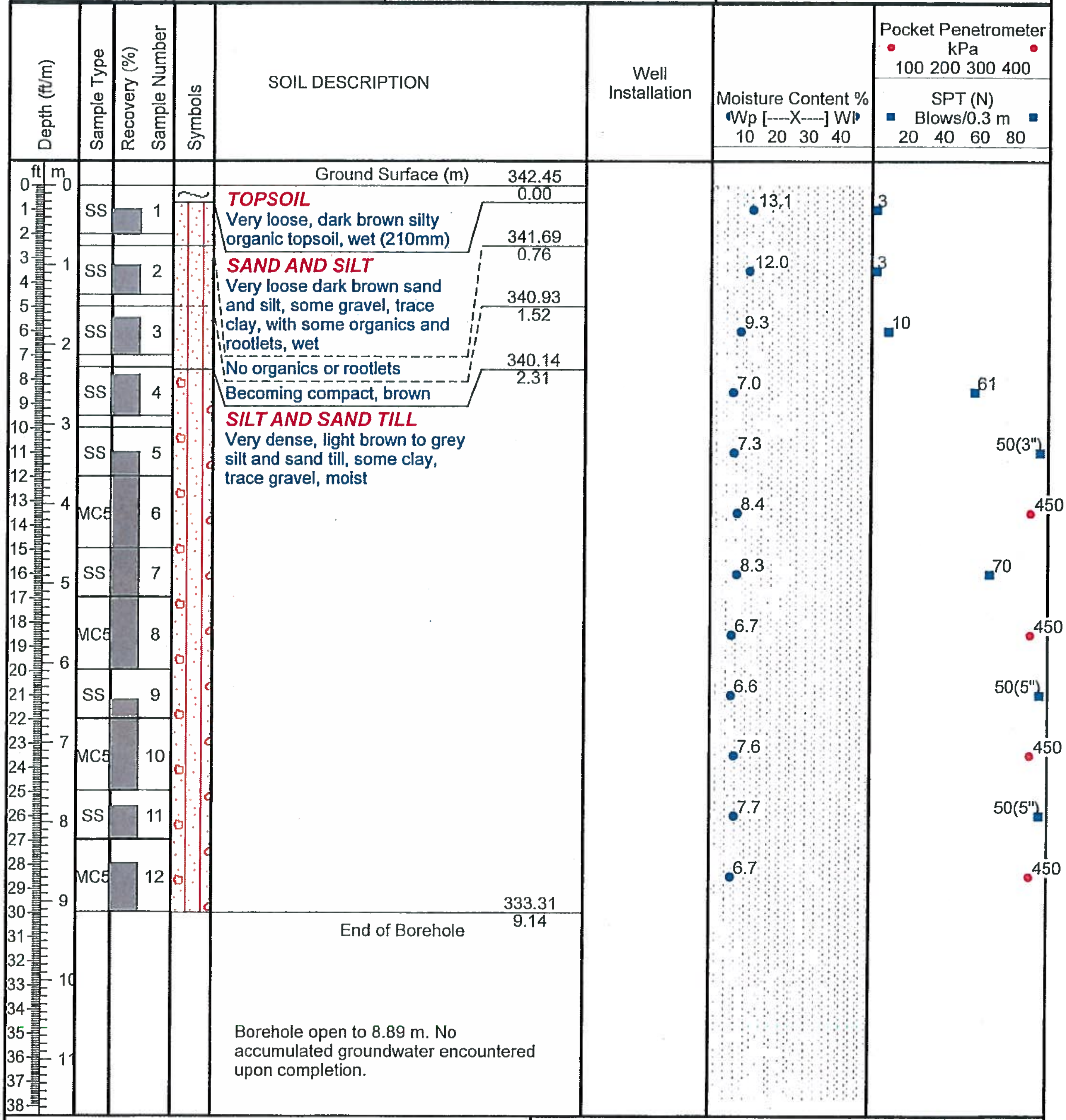
BOREHOLE 4

Page 1 of 1

Date Drilled: April 18, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 342.45 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



SOIL DESCRIPTION

Ground Surface (m) 342.45

0.00		
TOPSOIL Very loose, dark brown silty organic topsoil, wet (210mm)	341.69	0.76
SAND AND SILT Very loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet	340.93	1.52
No organics or rootlets	340.14	2.31
Becoming compact, brown		
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	333.31	9.14
End of Borehole		

SS	1	13.1	3
SS	2	12.0	3
SS	3	9.3	10
SS	4	7.0	61
SS	5	7.3	50(3")
MC5	6	8.4	450
SS	7	8.3	70
MC5	8	6.7	450
SS	9	6.6	50(5")
MC5	10	7.6	450
SS	11	7.7	50(5")
MC5	12	6.7	450

Borehole open to 8.89 m. No accumulated groundwater encountered upon completion.

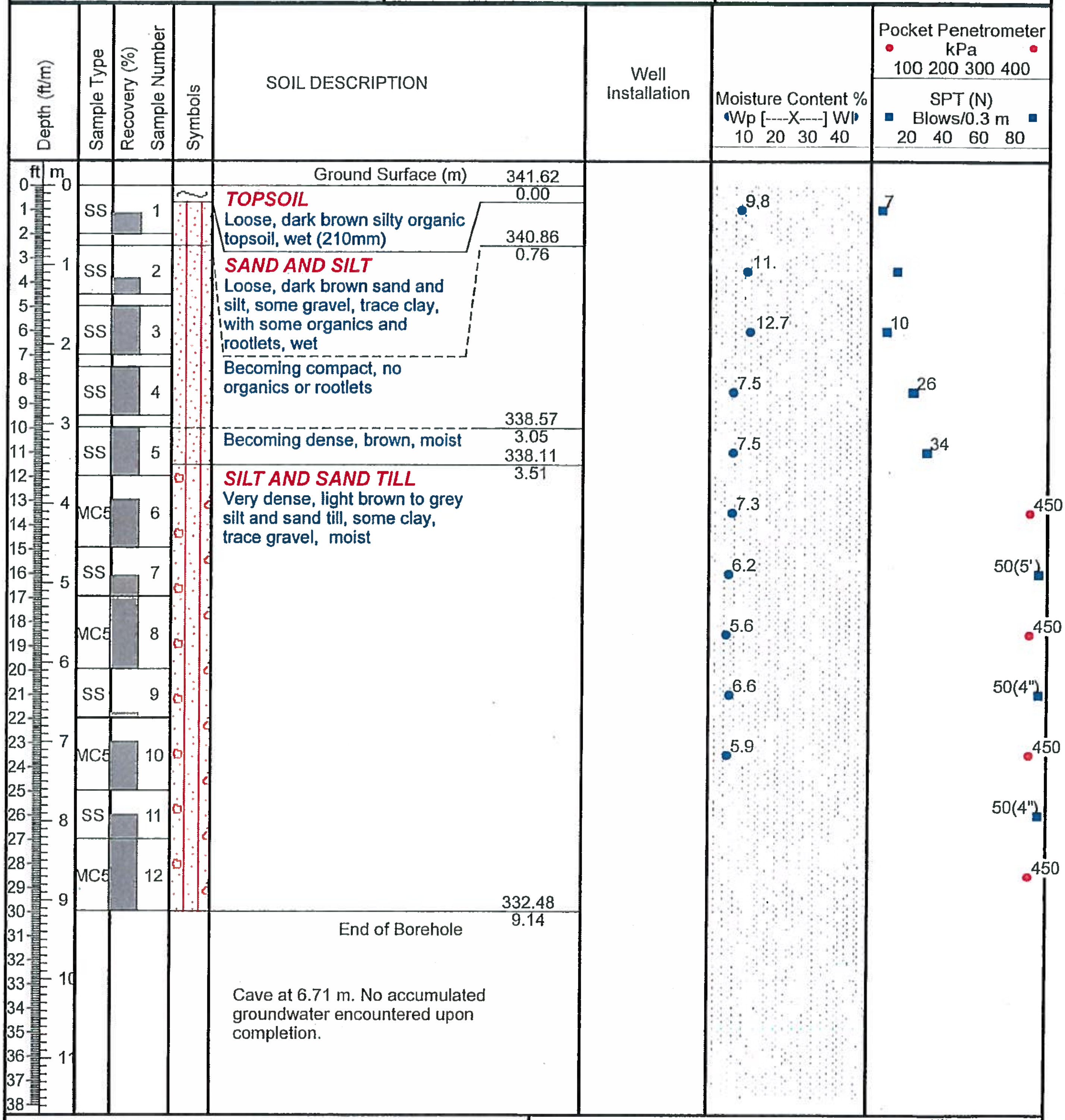
BOREHOLE 5

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 341.62 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m) 341.62
0.00

TOPSOIL
Loose, dark brown silty organic topsoil, wet (210mm)

340.86
0.76

SAND AND SILT
Loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

Becoming compact, no organics or rootlets

338.57
3.05

Becoming dense, brown, moist

338.11
3.51

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

332.48
9.14

End of Borehole

Cave at 6.71 m. No accumulated groundwater encountered upon completion.

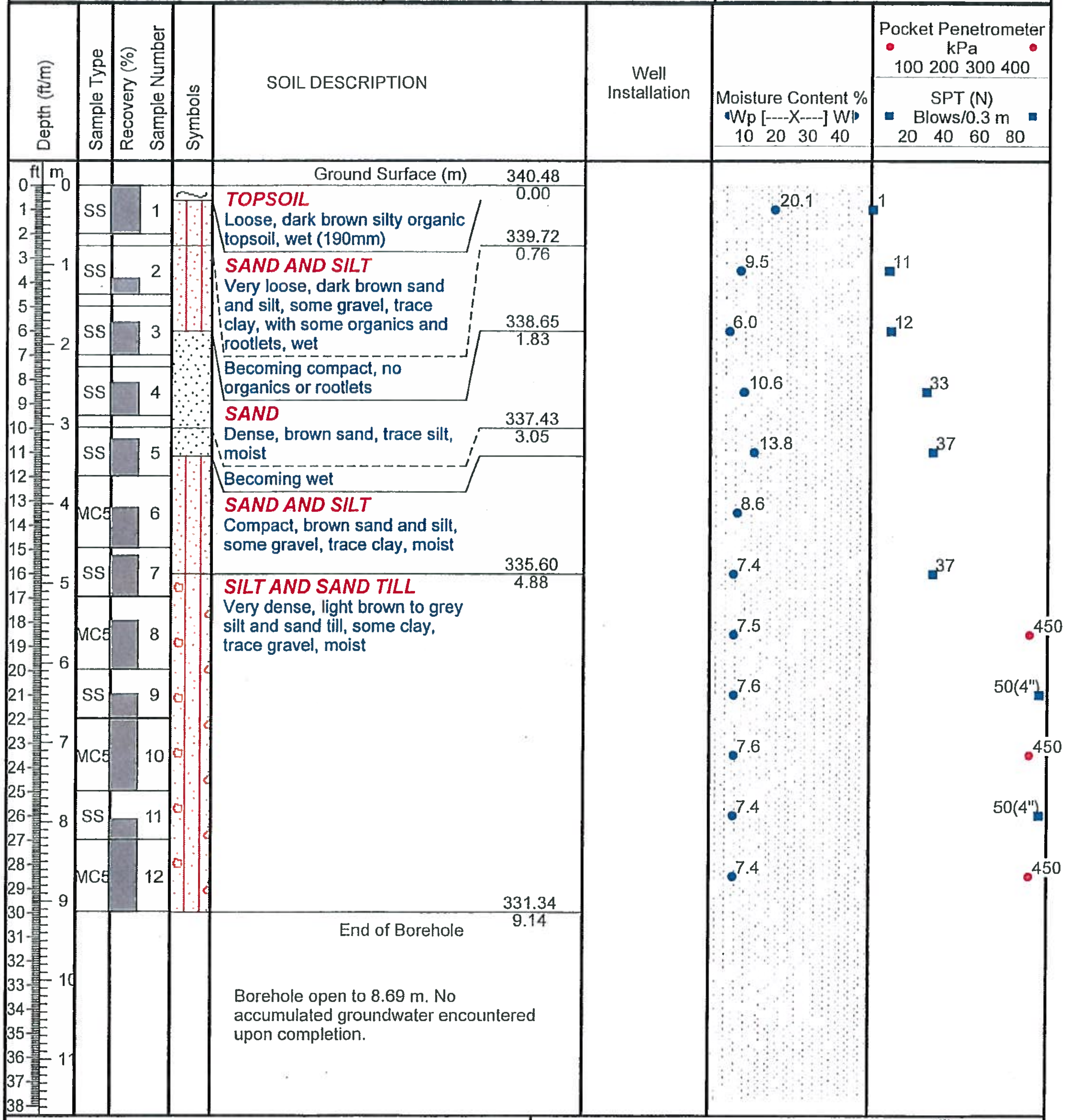
BOREHOLE 6

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 340.48 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Elevation (m) / Depth (m)	SOIL DESCRIPTION
340.48	Ground Surface (m)
0.00	**TOPSOIL** Loose, dark brown silty organic topsoil, wet (190mm)
339.72 0.76	**SAND AND SILT** Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet Becoming compact, no organics or rootlets
338.65 1.83	**SAND** Dense, brown sand, trace silt, moist Becoming wet
337.43 3.05	**SAND AND SILT** Compact, brown sand and silt, some gravel, trace clay, moist
335.60 4.88	**SILT AND SAND TILL** Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist
331.34 9.14	End of Borehole

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	20.1	1	
SS	2	9.5	11	
SS	3	6.0	12	
SS	4	10.6	33	
SS	5	13.8	37	
MC5	6	8.6		
SS	7	7.4	37	
MC5	8	7.5		450
SS	9	7.6	50(4")	
MC5	10	7.6		450
SS	11	7.4	50(4")	
MC5	12	7.4		450

Borehole open to 8.69 m. No accumulated groundwater encountered upon completion.

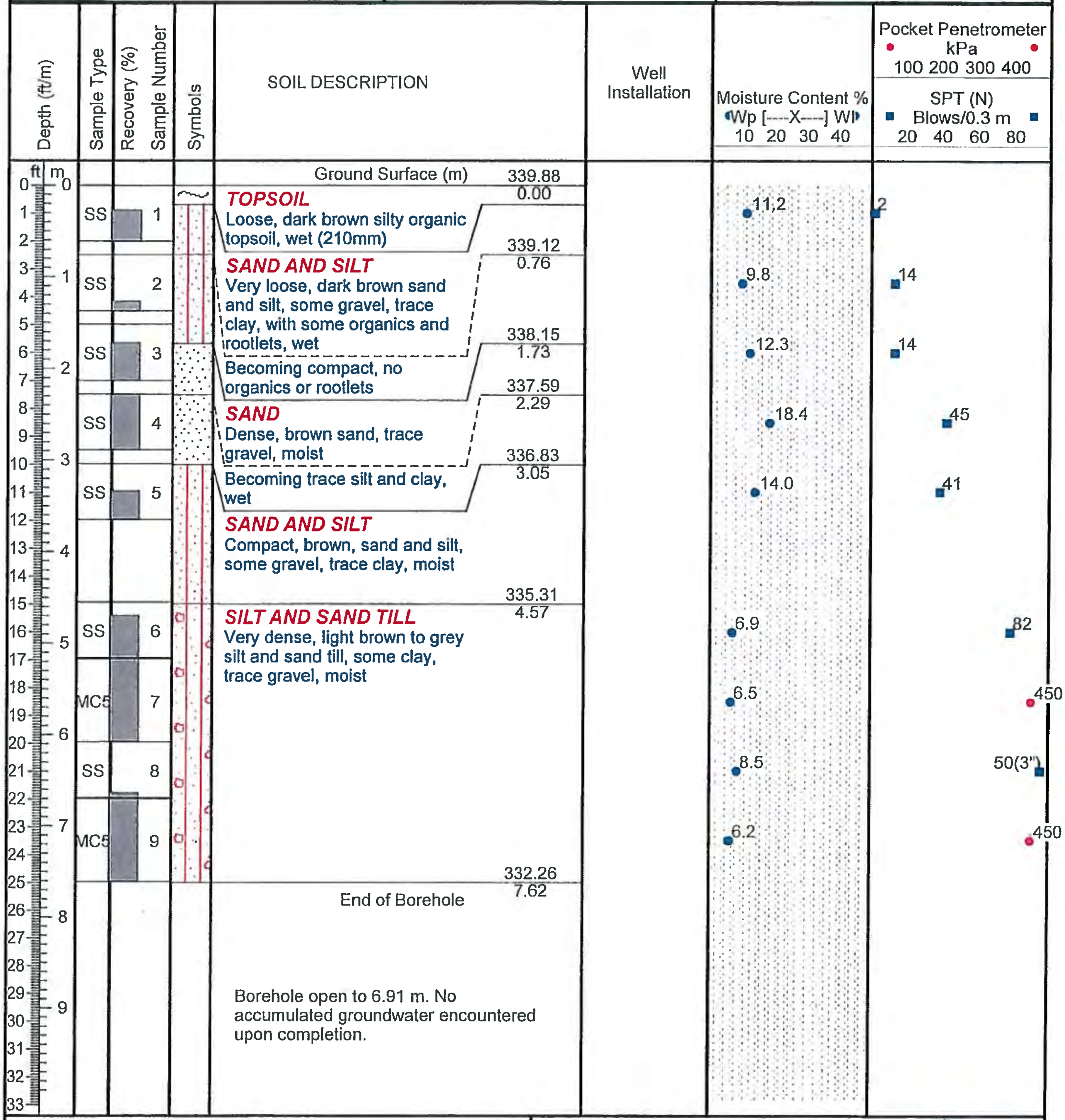
BOREHOLE 7

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 339.88 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



SOIL DESCRIPTION	Elevation (m)	Depth (m)
Ground Surface (m)	339.88	0.00
TOPSOIL Loose, dark brown silty organic topsoil, wet (210mm)	339.12	0.76
SAND AND SILT Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet Becoming compact, no organics or rootlets	338.15	1.73
	337.59	2.29
SAND Dense, brown sand, trace gravel, moist Becoming trace silt and clay, wet	336.83	3.05
SAND AND SILT Compact, brown, sand and silt, some gravel, trace clay, moist	335.31	4.57
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	332.26	7.62
End of Borehole		

Sample Type	Sample Number	Moisture Content %	SPT (N)	Pocket Penetrometer kPa
SS	1	11,2	2	
SS	2	9.8	14	
SS	3	12.3	14	
SS	4	18.4	45	
SS	5	14.0	41	
SS	6	6.9	82	
MC5	7	6.5		450
SS	8	8.5	50(3")	
MC5	9	6.2		450

Borehole open to 6.91 m. No accumulated groundwater encountered upon completion.

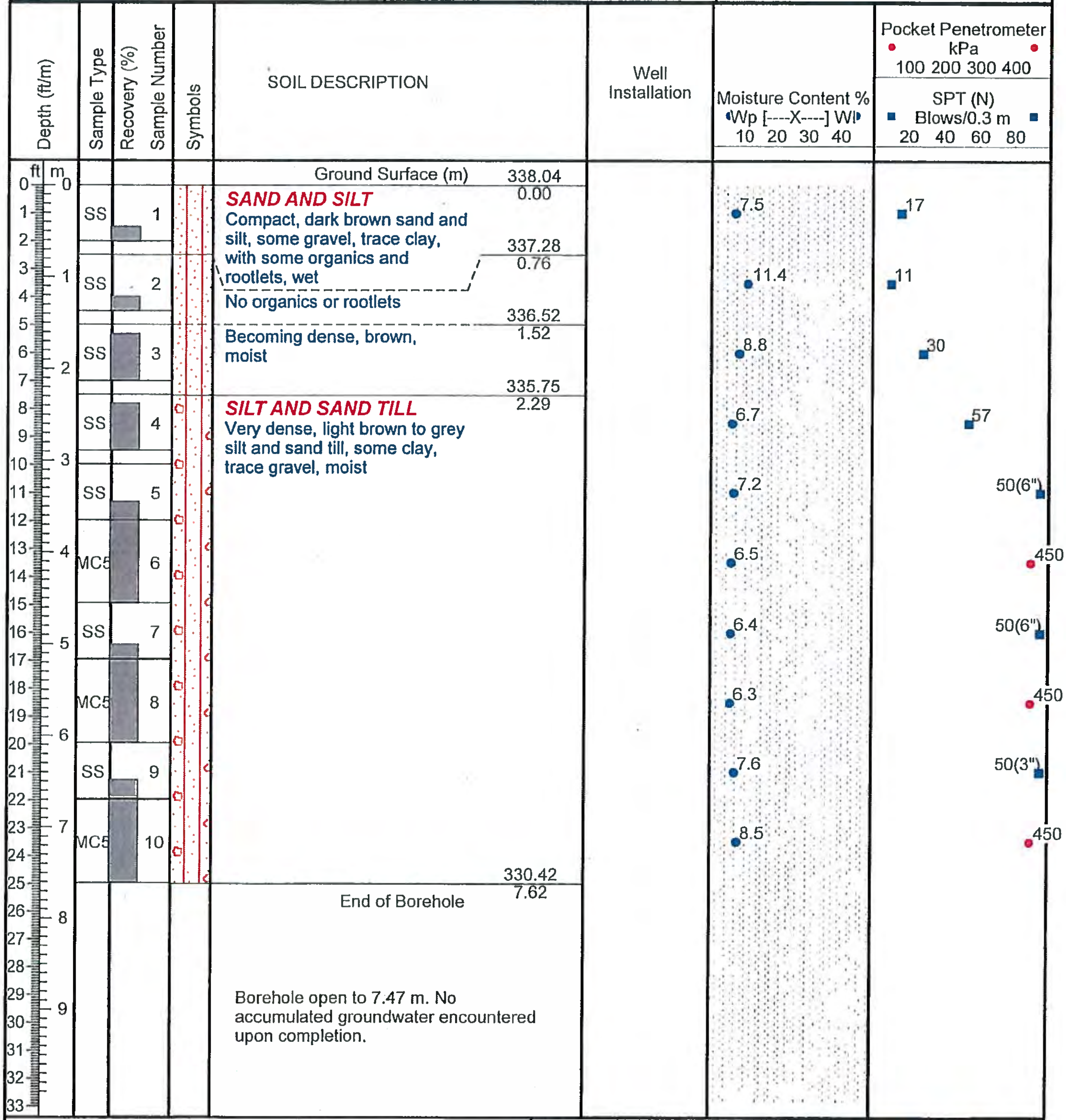
BOREHOLE 8

Page 1 of 1

Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 338.04 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



Ground Surface (m)	338.04
	0.00

SAND AND SILT
Compact, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet

337.28
0.76

No organics or rootlets

336.52
1.52

Becoming dense, brown, moist

335.75
2.29

SILT AND SAND TILL
Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist

330.42
7.62

End of Borehole

Borehole open to 7.47 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N) Blows/0.3 m	Pocket Penetrometer kPa
SS	1	7.5	17	
SS	2	11.4	11	
SS	3	8.8	30	
SS	4	6.7	57	
SS	5	7.2	50(6")	
MC5	6	6.5		450
SS	7	6.4	50(6")	
MC5	8	6.3		450
SS	9	7.6	50(3")	
MC5	10	8.5		450

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

BOREHOLE 9

Page 1 of 1

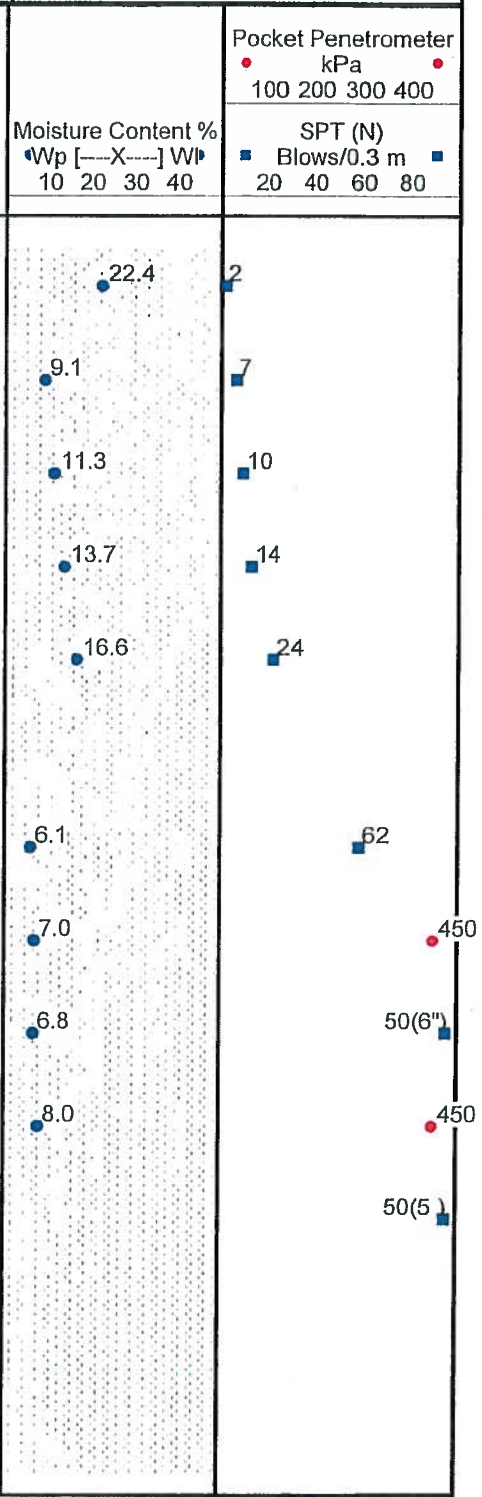
Date Drilled: April 19, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 339.15 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON

Elevation (m)	Depth (m)	SOIL DESCRIPTION
339.15	0.00	Ground Surface (m)
339.15	0.00	***TOPSOIL*** Very loose, dark brown silty organic topsoil, wet (210mm)
338.39	0.76	***SAND AND SILT*** Very loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet Becoming loose, no organics or rootlets
337.63	1.52	***SAND*** Compact, brown sand, trace silt and gravel, wet
334.58	4.57	***SILT AND SAND TILL*** Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist
330.92	8.23	End of Borehole

Borehole open to 4.70 m. Groundwater accumulated to 3.17 m upon completion.



Sample Type	Sample Number	Moisture Content %	SPT (N) / Pocket Penetrometer kPa
SS	1	22.4	2
SS	2	9.1	7
SS	3	11.3	10
SS	4	13.7	14
SS	5	16.6	24
SS	6	6.1	62
MC5	7	7.0	450
SS	8	6.8	50(6")
MC5	9	8.0	450
SS	10		50(5)

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

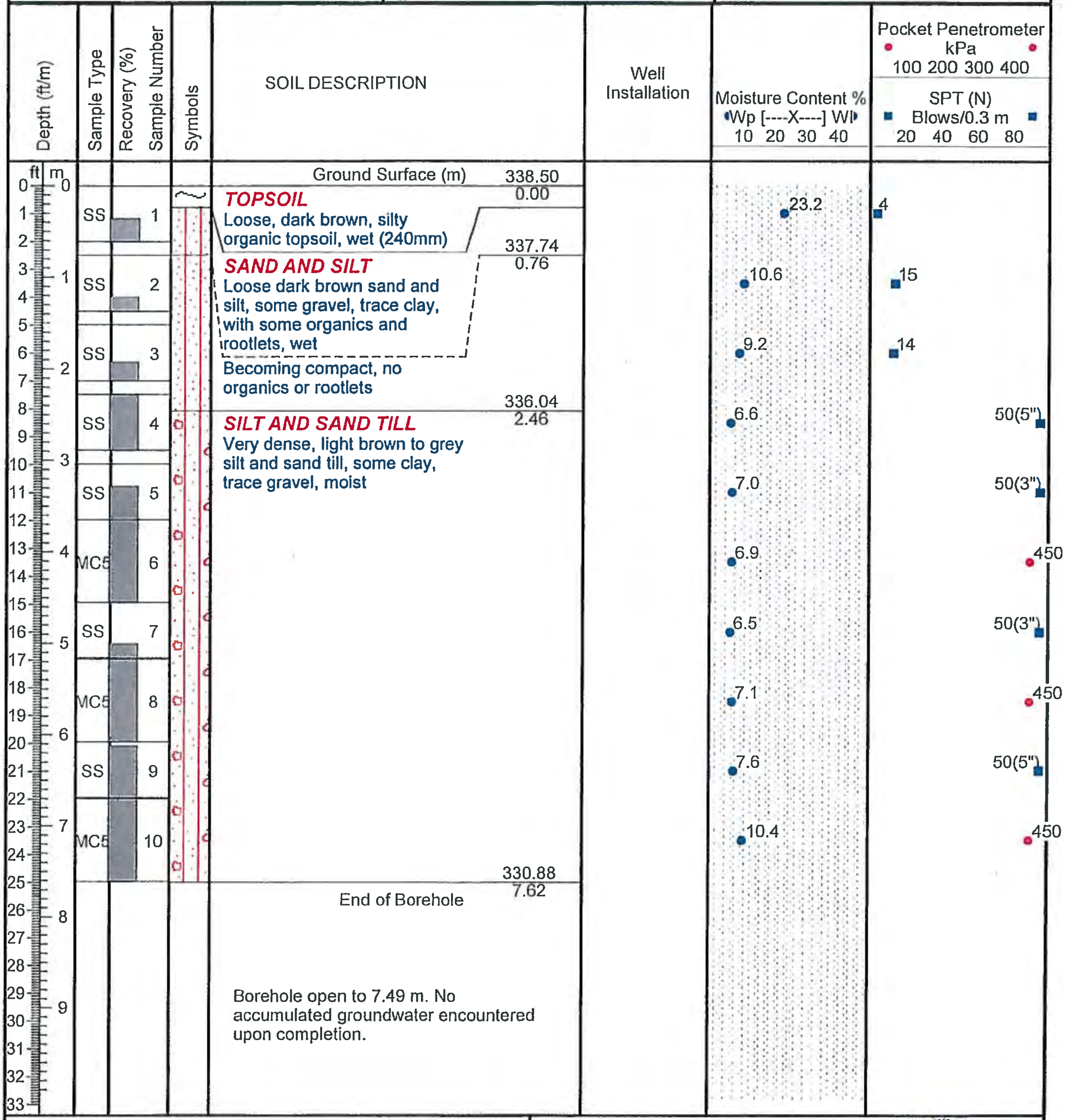
BOREHOLE 10

Page 1 of 1

Date Drilled: April 17, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 338.50 m
Logged by: SW

Project No.: 18-099
Project: Two 12 Storey Appt. Buildings
Location: 1242, 1250, 1260 Gordon St
Guelph, ON



SOIL DESCRIPTION	Elevation (m)	Depth (m)
Ground Surface (m)	338.50	0.00
TOPSOIL Loose, dark brown, silty organic topsoil, wet (240mm)	337.74	0.76
SAND AND SILT Loose dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet Becoming compact, no organics or rootlets	336.04	2.46
SILT AND SAND TILL Very dense, light brown to grey silt and sand till, some clay, trace gravel, moist	330.88	7.62
End of Borehole		

Borehole open to 7.49 m. No accumulated groundwater encountered upon completion.

Sample Type	Sample Number	Moisture Content %	SPT (N) Blows/0.3 m	Pocket Penetrometer kPa
SS	1	23.2	4	
SS	2	10.6	15	
SS	3	9.2	14	
SS	4	6.6	50(5")	
SS	5	7.0	50(3")	
MC5	6	6.9		450
SS	7	6.5	50(3")	
MC5	8	7.1		450
SS	9	7.6	50(5")	
MC5	10	10.4		450

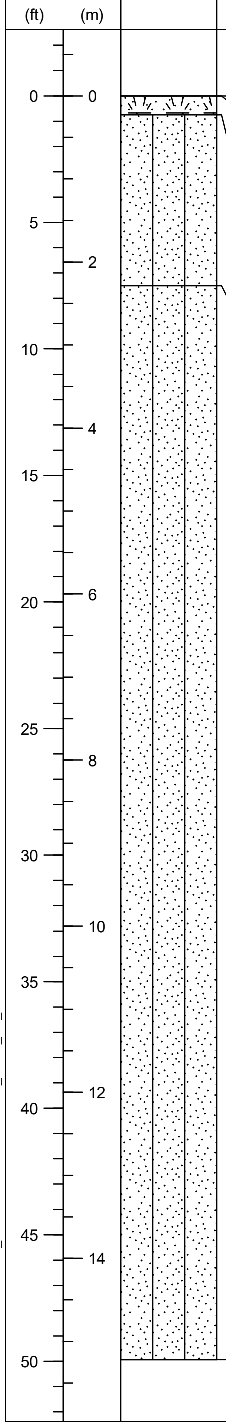
Monitoring Well: MW1-18

Project: 1242, 1250 and 1260 Gordon Street and 9 Valley Road
Client: Tricar Developments Inc.
Location: Guelph, Ontario
Number: 161413684

Field Investigator: C. Davis
Contractor: Aardvark Drilling, Inc
Drilling method: Hollow Stem Auger
Date started/completed: 30-Jul-2018

Ground surface elevation: 343.92 m AMSL
Top of casing elevation: 344.72 m AMSL
Easting: 564468
Northing: 4818537

SUBSURFACE PROFILE

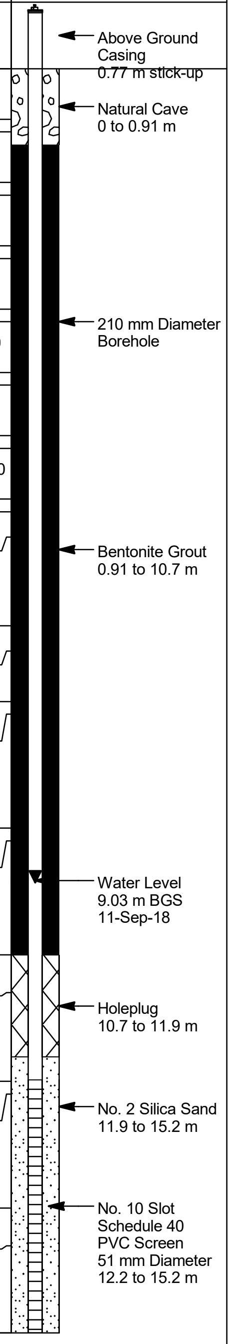


Elevation (m AMSL) Depth (m BGS)	Lithologic Description
344.72	
343.92 0.00	Ground Surface
	TOPSOIL Loose, very dark brown (7.5 YR 2/3), silty sand, fine to medium grained sand, fine gravel, dry to moist
343.69 0.23	SILTY SAND Compact, yellowish brown (10 YR 5/4), fine to coarse grained sand, trace fine gravel, trace to some clay in dry clumps, dry to moist
	Becoming moist at 1.1 m BGS
	Clay and gravel content increases at 1.5 m BGS Colour change to brown (10 YR 5/3) at 1.6 m BGS Becomes moist to wet at 1.9 m BGS Limestone cobble at 2.1 m BGS
341.63 2.29	SILTY SAND TILL Compact, pale brown (10 YR 6/3), fine to coarse grained sand, limestone fragments, trace to some clay in clumps, fine gravel and cobbles (angular), dry to moist
	Becoming dense at 3.0 m BGS
	Metamorphic rock fragments at 3.6 m BGS Very dense, increased clay content starting at 3.8 m BGS
	Cobble/boulders from 5.5 to 6.7 m BGS
	At 6.8 m BGS, becomes very dense, grey, fine silty sand, trace medium and coarse grained sand, trace gravel, dry
	Some rounded fine gravel at 7.6 m BGS
	Becoming less compact, trace limestone fragments, moist at 10.7 m BGS
	Cobble at 11.2 m BGS
	Becoming moist at 14.0 m BGS
328.70 15.22	End of Borehole

SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	6" 25%	2-5-6-4 (11)
2	SS	18" 75%	5-8-8-11 (16)
3	SS	21" 88%	4-6-7-10 (13)
4	SS	24" 100%	5-8-10-12 (18)
5	SS	24" 100%	9-20-15-40 (35)
6	SS	24" 100%	29-37-50 (87)
7	SS	24" 100%	29-31-49-50 (80)
8	SS	10.5" 88%	13-50 (50)
9	SS	11" 92%	40-50 (50)
10	SS	n/a	50 (0)
11	SS	5" 83%	50 (0)
12	SS	22" 122%	28-40-50 (90)
13	SS	6" 100%	50 (0)
14	SS	19" 106%	47-35-50 (85)
15	SS	0" 0%	50 (0)

WELL DETAILS



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Stantec

Drawn By/Checked By: AH / SR / GW

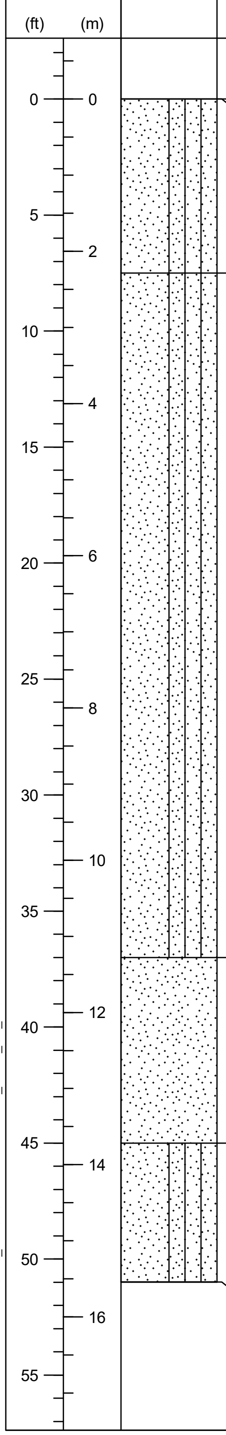
Monitoring Well: MW2-18

Project: 1242, 1250 and 1260 Gordon Street and 9 Valley Road
Client: Tricar Developments Inc.
Location: Guelph, Ontario
Number: 161413684

Field Investigator: A. Healey
Contractor: Aardvark Drilling, Inc
Drilling method: Hollow Stem Auger
Date started/completed: 09-Jul-2018 / 10-Jul-2018

Ground surface elevation: 342.97 m AMSL
Top of casing elevation: 343.77 m AMSL
Easting: 564471
Northing: 4818517

SUBSURFACE PROFILE

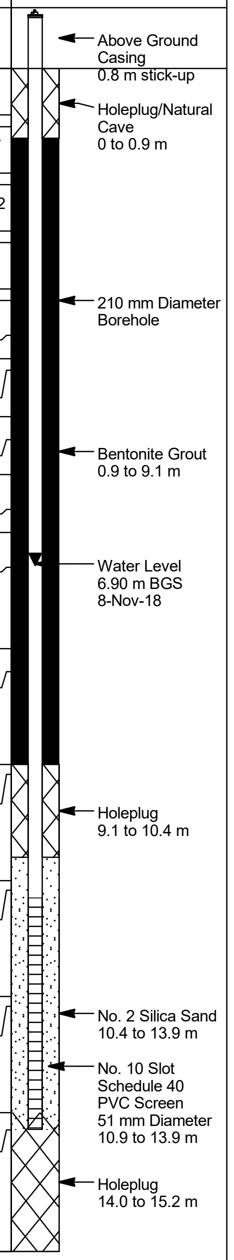


Lithologic Description	Elevation (m AMSL) Depth (m BGS)
	343.77
Ground Surface	342.97
SANDY SILT Loose, 10 YR 4/3 brown, with organics (roots) and some subangular coarse gravel, dry	0.00
Compact, organics no longer visible, increased subangular fine and coarse gravel, change in colour to 10 YR 6/3 pale brown at 0.76 m BGS, crumbles easily	
becoming more silt with some sand, some subangular fine and coarse gravel, moist to dry	340.68
SANDY SILT TILL Compact, 10 YR 5/3 brown, fine sand with some clay and angular fine and coarse gravel, trace coarse sand, moist	2.29
Very dense, trace 10 YR 6/1 gray coarse gravel/cobble	
10 YR 6/1 gray cobble at 5.0 m BGS	
becoming slightly more moist than above	
change in colour to 10 YR 6/2 light brownish gray	331.69
SAND Very dense, medium to coarse sand, some subangular fine gravel, trace coarse gravel, wet	11.28
	329.25
SANDY SILT TILL Very dense, 10 YR 6/2 light brownish gray, some medium sand and fine to coarse gravel, trace clay, moist crushed cobble at 13.8 m BGS increased clay content at 13.9 m BGS	13.72
crushed cobble at 15.3 m BGS	327.43
End of Borehole	15.54

SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	17" 71%	3-3-3-10 (6)
2	SS	19" 79%	8-11-14-17 (25)
3	SS	20" 83%	10-11-11-12 (22)
4	SS	24" 100%	4-7-9-18 (16)
5	SS	19" 106%	13-30-50 (80)
6	SS	2" 33%	50 (0)
7	SS	14" 117%	30-50 (50)
8	SS	20" 111%	26-39-50 (89)
9	SS	23" 128%	30-42-50 (92)
10	SS	13" 108%	31-50 (50)
11	SS	6" 119%	50/5.0" (50/5.0")
12	SS	8" 159%	50/5.0" (50/5.0")
13	SS	4" 79%	50/5.0" (50/5.0")
14	SS	15" 167%	47-50/3.0" (50/3.0")
15	SS	18" 150%	41-50 (50)

WELL DETAILS



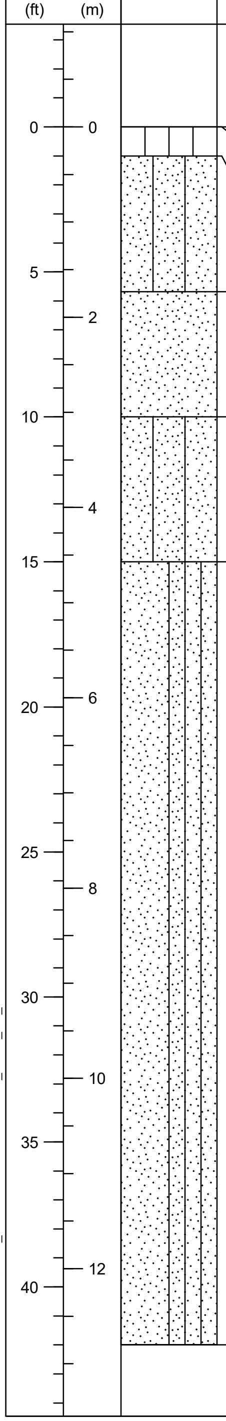
Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Drawn By/Checked By: AH / SR / GW

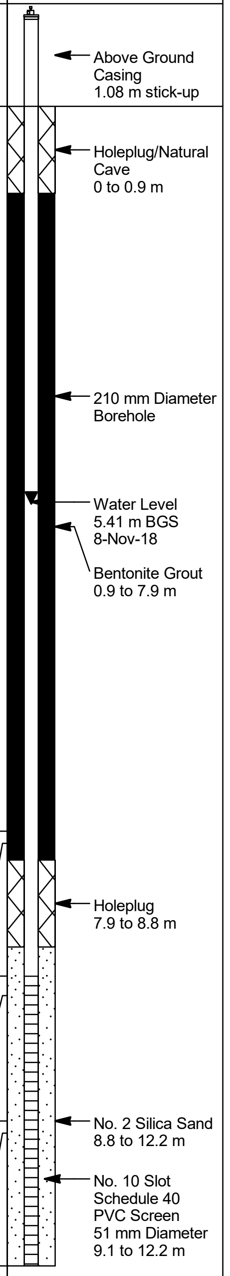
Monitoring Well: MW3-18

Project:	1242, 1250 and 1260 Gordon Street and 9 Valley Road	**Field Investigator:**	A. Healey	**Ground surface elevation:**	339.83 m AMSL
Client:	Tricar Developments Inc.	**Contractor:**	Aardvark Drilling, Inc	**Top of casing elevation:**	340.91 m AMSL
Location:	Guelph, Ontario	**Drilling method:**	Hollow Stem Auger	**Easting:**	564469
Number:	161413684	**Date started/completed:**	12-Jul-2018 / 13-Jul-2018	**Northing:**	4818474

SUBSURFACE PROFILE — SAMPLE DETAILS — WELL DETAILS



Elevation (m AMSL) Depth (m BGS)	Lithologic Description	Sample Number	Sample Type	Recovery	N Value
340.91					
339.83 0.00	Ground Surface TOPSOIL Loose, dark brown silty organic topsoil, wet				
339.53 0.30	SAND AND SILT Very loose, dark brown sand and silt, some gravel, trace clay, with some organics and rootlets, wet becoming compact, no organics or rootlets				
338.10 1.73	SAND Dense, brown sand, trace gravel, moist becoming trace silt and clay, wet				
336.78 3.05	SAND AND SILT Compact, brown, sand and silt, some gravel, trace clay, moist				
335.26 4.57	SANDY SILT TILL Very dense, 10 YR 6/1 gray, fine sand with trace coarse sand and fine gravel, trace clay, moist				
		1	SS	5" 99%	50/5.0" (50/5.0")
		2	SS	12" 149%	43-50/2.0" (50/2.0")
	wet at 9.4 m BGS				
	trace coarse gravel at 10.8 m BGS	3	SS	6" 119%	50/5.0" (50/5.0")
		4	SS	12" 109%	49-50/5.0" (50/5.0")
327.03 12.80	End of Borehole				



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Well was straight drilled to 7.6 m due to proximity of well in comparison to recently drilled borehole (BH7, drilled April 19, 2018 by CMT Drilling Inc.). Stratigraphy from 0-7.6 m is inferred from this borehole log.

Stantec

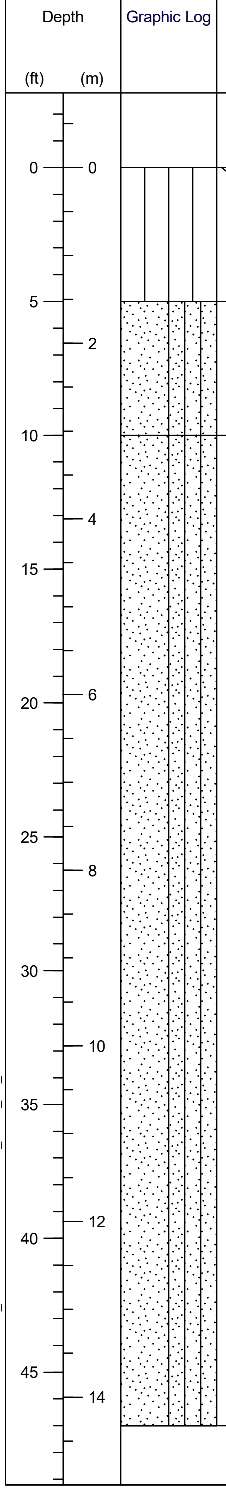
Drawn By/Checked By: AH / SR / GW

Monitoring Well: MW4-18 (S/D)

Project: 1242, 1250 and 1260 Gordon Street and 9 Valley Road
Client: Tricar Developments Inc.
Location: Guelph, Ontario
Number: 161413684

Field Investigator: A. Healey
Contractor: Aardvark Drilling, Inc
Drilling method: Hollow Stem Auger
Date started/completed: 11-Jul-2018 / 12-Jul-2018

SUBSURFACE PROFILE



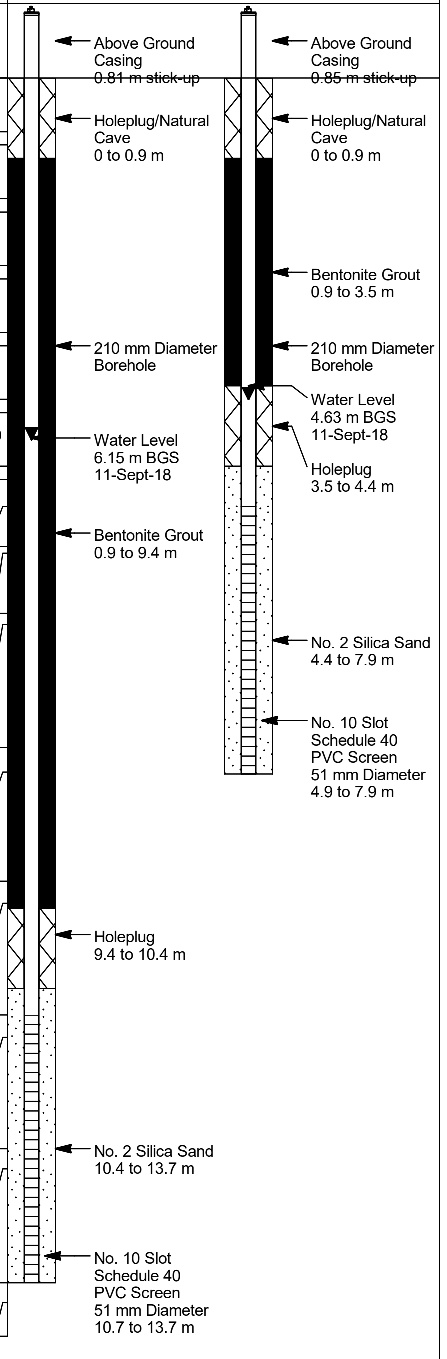
Lithologic Description	Elevation (m AMSL) Depth (m BGS)
	341.32
Ground Surface	340.47 0.00
SILT (TOPSOIL) Loose, 10 YR 5/3 brown to 10 YR 5/4 yellowish brown, trace to some fine sand, some organics and fine and coarse gravel (subangular) in top 2 cm, moist compact, increased sand and fine gravel content starting at 1.0 m BGS crushed coarse gravel/cobble at 1.3 m BGS	338.95
SANDY SILT Loose, 10 YR 5/4 yellowish brown, fine sand with some medium to coarse sand and fine to coarse subangular gravel, trace clay, moist compact, crushed coarse gravel/cobble at 2.5 m BGS	1.52 337.42
SANDY SILT TILL Compact, 10 YR 5/3 brown, fine sand and some medium to coarse sand, some fine to coarse gravel, trace clay, moist minor reddish brown mottling at 3.4 m BGS dense, increased sand and gravel content from 3.8 to 4.4 m BGS crushed coarse gravel/cobble at 4.6 and 4.8 m BGS crushed coarse gravel/cobble at 5.3 and 6.2 m BGS change in colour to 10 YR 5/1 gray at 6.1 m BGS, wet coarse gravel at 12.3 m BGS becoming slightly softer at 12.5 m BGS	3.05 326.14
End of Borehole	14.33

SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	20" 83%	3-3-2-2 (5)
2	SS	14" 58%	3-8-18-23 (26)
3	SS	16" 67%	3-4-5-7 (9)
4	SS	20" 83%	11-10-9-7 (19)
5	SS	24" 100%	4-4-12-15 (16)
6	SS	25" 104%	11-21-20-20 (41)
7	SS	12" 100%	46-50 (50)
8	SS	4" 133%	50/3.0" (50/3.0")
9	SS	9" 179%	50/5.0" (50/5.0")
10	SS	18" 163%	44-50/5.0" (50/5.0")
11	SS	17" 171%	49-50/4.0" (50/4.0")
12	SS	13" 131%	49-50/4.0" (50/4.0")
13	SS	14" 156%	39-50/3.0" (50/3.0")
14	SS	12" 133%	48-50/3.0" (50/3.0")

WELL DETAILS

Name:	MW4-18D	Name:	MW4-18S
GS Elev:	340.47 m AMSL	GS Elev:	340.47 m AMSL
TOC Elev:	341.28 m AMSL	TOC Elev:	341.32 m AMSL
Easting:	564506	Easting:	564506
Northing:	4818478	Northing:	4818478
Stick-up:	0.81 m	Stick-up:	0.85 m



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Drawn By/Checked By: AH / SR / GW

Monitoring Well: MW5-18 (S/D)

Project: 1242, 1250 and 1260 Gordon Street and 9 Valley Road
Client: Tricar Developments Inc.
Location: Guelph, Ontario
Number: 161413684

Field Investigator: A. Healey
Contractor: Aardvark Drilling, Inc
Drilling method: Hollow Stem Auger
Date started/completed: 10-Jul-2018 / 11-Jul-2018

SUBSURFACE PROFILE

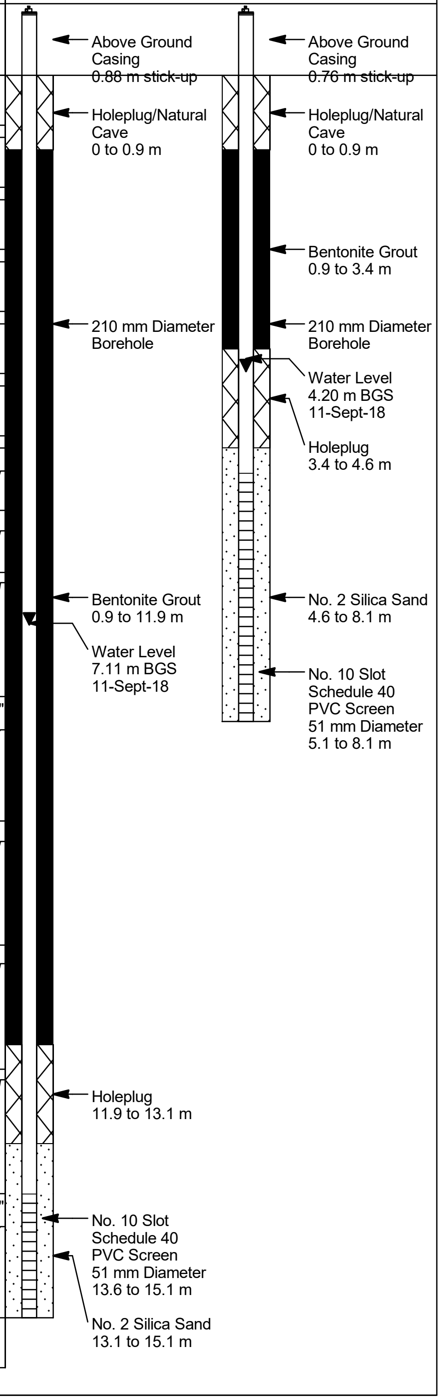
Elevation (m AMSL) Depth (m BGS)	Lithologic Description
342.02	
341.14 0.00	Ground Surface
	SILT Loose, 10 YR 4/2 dark grayish brown with organics, trace clay and fine to coarse sand, moist
340.78 0.36	SILT Compact, 10 YR 4/3 brown, trace clay and fine to coarse sand, moist increased coarse sand content, trace subangular fine gravel crushed 10 YR 6/1 gray coarse gravel, cobbles further increase of coarse sand and fine gravel content, increased moisture content some coarse gravel starting at 2.0 m BGS
338.60 2.54	SANDY SILT TILL Compact, 10 YR 6/3 pale brown, fine sand, some medium to coarse sand and fine to coarse subangular gravel, moist 10 YR 6/1 gray coarse gravel/cobble at 2.8 m BGS becoming less compact from 3.0 to 3.6 m BGS very dense, some coarse gravel starting at 3.7 m BGS minor reddish brown mottling from 4.3 to 7.6 m BGS coarse gravel/cobble at 4.9 m BGS change in colour to 10 YR 6/2 light brownish gray at 6.1 m BGS coarse gravel/cobble at 6.2 m BGS coarse gravel/cobble at 8.1 m BGS medium to coarse sand content increasing starting at 10.8 m BGS becomes less dense and moisture content increases at 13.8 m BGS, reduced sand content
325.29 15.85	End of Borehole

SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	19" 79%	3-3-3-4 (6)
2	SS	18" 75%	3-4-12-9 (16)
3	SS	15" 63%	2-7-13-12 (20)
4	SS	14" 58%	4-8-9-11 (17)
5	SS	14" 58%	3-4-6-12 (10)
6	SS	30" 125%	15-31-36-32 (67)
7	SS	23" 208%	21-50/5.0" (50/5.0")
8	SS	7" 70%	50 (0)
9	SS	6" 119%	50/5.0" (50/5.0")
10	SS	18" 113%	16-27-50/4.0" (50/4.0")
11	SS	12" 120%	48-50/4.0" (50/4.0")
12	SS	16" 178%	45-50/3.0" (50/3.0")
13	SS	5" 99%	50/5.0" (50/5.0")
14	SS	27" 169%	13-27-50/4.0" (50/4.0")
15	SS	23" 96%	30-40-47-47 (87)

WELL DETAILS

Name:	MW5-18D	Name:	MW5-18S
GS Elev:	341.14 m AMSL	GS Elev:	341.26 m AMSL
TOC Elev:	342.02 m AMSL	TOC Elev:	342.02 m AMSL
Easting:	564540	Easting:	564540
Northing:	4818521	Northing:	4818521
Stick-up:	0.88 m	Stick-up:	0.76 m



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Drawn By/Checked By: AH / SR / GW

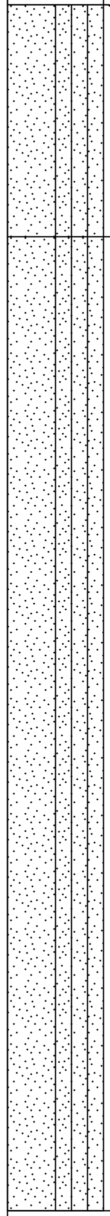
STANTEC BOREHOLE AND WELL - MASTER 17X11 20180723_AH.GPJ DATA TEMPLATE_ENVS_CA_140725.GDT 3/30/20 SRIXON

Monitoring Well: MW6-18

Project:	1242, 1250 and 1260 Gordon Street and 9 Valley Road	**Field Investigator:**	A. Healey	**Ground surface elevation:**	341.40 m AMSL
Client:	Tricar Developments Inc.	**Contractor:**	Aardvark Drilling, Inc	**Top of casing elevation:**	342.55 m AMSL
Location:	Guelph, Ontario	**Drilling method:**	Hollow Stem Auger	**Easting:**	564586
Number:	161413684	**Date started/completed:**	13-Jul-2018 / 16-Jul-2018	**Northing:**	4818487

SUBSURFACE PROFILE

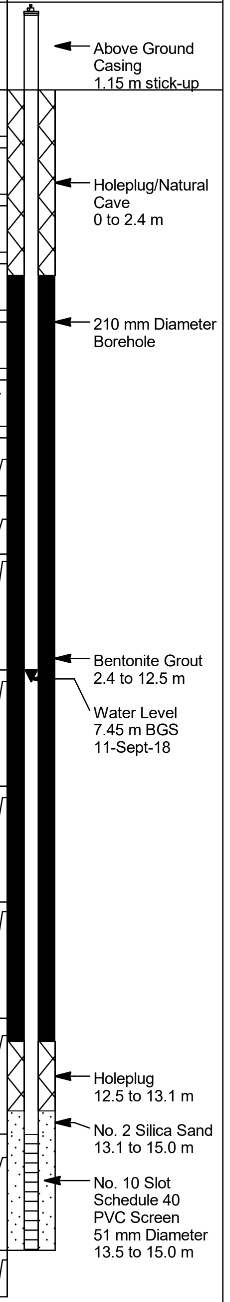
Depth (ft)	Depth (m)	Lithologic Description	Elevation (m AMSL) Depth (m BGS)
			342.55
0	0	Ground Surface	341.40 0.00
		SANDY SILT Loose, 10 YR 4/3 brown, fine sand, some organics, trace fine gravel, moist to dry becoming trace organics starting at 0.3 m BGS becoming moist at 0.43 m BGS some coarse sand and fine gravel starting at 0.89 m BGS	
5	2	minor reddish brown mottling from 1.8 to 2.0 m BGS	
10		SANDY SILT TILL Very dense, 10 YR 6/3 pale brown, fine sand, some medium to coarse sand and fine to coarse gravel, trace clay, moist, crushed coarse gravel/cobbles throughout	338.35 3.05
15	4		
20	6		
25	8	change in colour to 7.5 YR 5/1 gray	
30	10		
35			
40	12	wet at 12.2 m BGS	
45	14	increase in clay content and decrease in sand content	
50			
	16	End of Borehole	325.55 15.85
55			



SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	18" 75%	3-4-5-12 (9)
2	SS	20" 83%	10-9-8-7 (17)
3	SS	13" 54%	5-5-4-7 (9)
4	SS	21" 88%	3-5-13-20 (18)
5	SS	27" 113%	8-21-26-37 (47)
6	SS	25" 104%	44-39-43-37 (82)
7	SS	12" 109%	44-50/5.0" (50/5.0")
8	SS	12" 100%	44-50 (50)
9	SS	6" 152%	50/4.0" (50/4.0")
10	SS	8" 133%	50 (0)
11	SS	6" 100%	50 (0)
12	SS	6" 119%	50/5.0" (50/5.0")
13	SS	11" 122%	40-50/3.0" (50/3.0")
14	SS	14" 117%	45-50 (50)
15	SS	8" 159%	50/5.0" (50/5.0")

WELL DETAILS



Stantec

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Drawn By/Checked By: AH / SR / GW

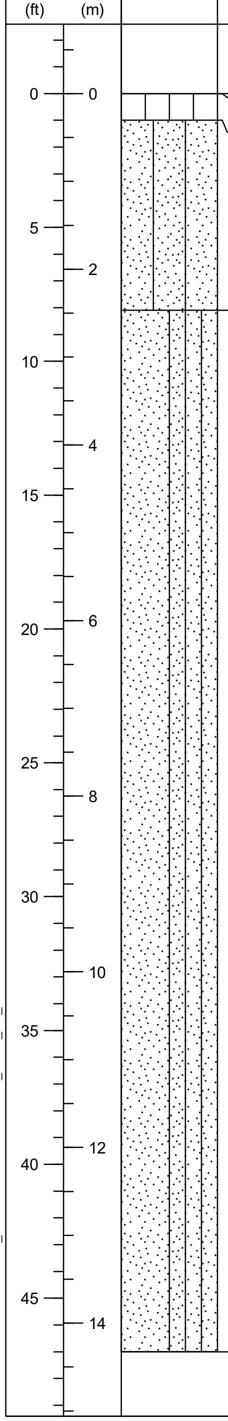
Monitoring Well: MW7-18

Project: 1242, 1250 and 1260 Gordon Street and 9 Valley Road
Client: Tricar Developments Inc.
Location: Guelph, Ontario
Number: 161413684

Field Investigator: A. Healey
Contractor: Aardvark Drilling, Inc
Drilling method: Hollow Stem Auger
Date started/completed: 16-Jul-2018

Ground surface elevation: 338.85 m AMSL
Top of casing elevation: 339.64 m AMSL
Easting: 564518
Northing: 4818416

SUBSURFACE PROFILE

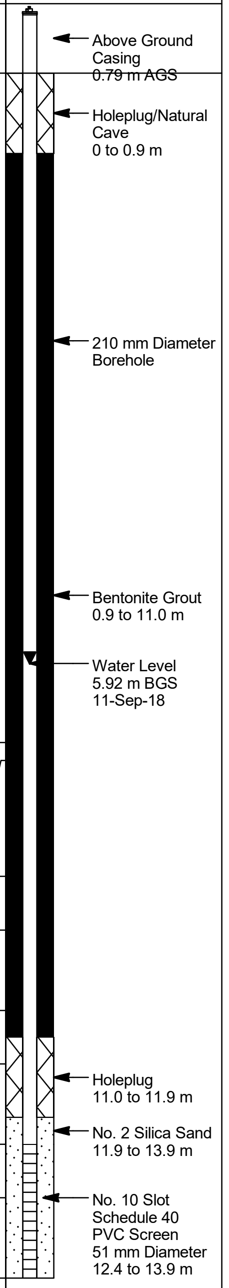


Lithologic Description	Elevation (m AMSL) Depth (m BGS)
	339.64
Ground Surface	338.85 0.00
TOPSOIL Loose, dark brown, silty organic topsoil	338.55 0.30
SAND AND SILT loose, dark brown, sand and silt, some gravel, trace clay, with some organics and rootlets, wet becoming compact, no organics or rootlets	336.38 2.47
SANDY SILT TILL Compact, 7.5 YR 5/2 brown, fine sand, trace medium to coarse sand, some fine subangular gravel, trace crushed gravel/cobble throughout, moist change in colour to 10 YR 5/1 gray at 9.1 m BGS becoming wet at 9.6 m BGS	324.52 14.33
End of Borehole	

SAMPLE DETAILS

Sample Number	Sample Type	Recovery	N Value
1	SS	13" 162%	44-50/2.0" (50/2.0")
2	SS	26" 108%	37-31-32-38 (63)
3	SS	26" 108%	13-20-22-30 (42)
4	SS	24" 100%	24-28-34-47 (62)
5	SS	25" 104%	14-13-24-27 (37)

WELL DETAILS



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available/applicable

Well was straight drilled to 7.6 m due to proximity of well in comparison to recently drilled borehole (BH10, drilled April 19, 2018 by CMT Drilling Inc.). Stratigraphy from 0-7.6 m is inferred from this borehole log.

Stantec

Drawn By/Checked By: AH / SR / GW

STANTEC BOREHOLE AND WELL - MASTER 17X11 20180723_AH.GPJ DATA TEMPLATE_ENVS_CA_140725.GDT 3/30/20 SRIXON

APPENDIX F:
LABORATORY CERTIFICATES OF ANALYSIS

Maxxam
A Bureau Veritas Group Company

Your Project #: 161413684
Site Location: GUELPH, ON
Your C.O.C. #: 111362

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2018/09/19
Report #: R5406235
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8N6455
Received: 2018/09/11, 16:40

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	2	N/A	2018/09/14	CAM SOP-00448	SM 23 2320 B m
Alkalinity	1	N/A	2018/09/19	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	3	N/A	2018/09/14	CAM SOP-00102	APHA 4500-CO2 D
Carbonaceous BOD	1	2018/09/12	2018/09/17	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2018/09/13	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	2	N/A	2018/09/14	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	1	N/A	2018/09/19	CAM SOP-00463	EPA 325.2 m
Conductivity	3	N/A	2018/09/14	CAM SOP-00414	SM 23 2510 m
Total Cyanide	1	2018/09/13	2018/09/13	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2018/09/14	CAM SOP-00446	SM 23 5310 B m
Fluoride	1	2018/09/12	2018/09/13	CAM SOP-00449	SM 23 4500-F C m
Hardness (calculated as CaCO3)	3	N/A	2018/09/17	CAM SOP 00102/00408/00447	SM 2340 B
Mercury in Water by CVAA	1	2018/09/14	2018/09/14	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	1	N/A	2018/09/14	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2018/09/17	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2018/09/19	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2018/09/13	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	3	N/A	2018/09/17		
Anion and Cation Sum	3	N/A	2018/09/17		
Fecal coliform, (5TMPN/100mL)	1	N/A	2018/09/11	BBY4 SOP-000127	MFHPB-19
Total Ammonia-N	3	N/A	2018/09/18	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	3	N/A	2018/09/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Animal and Vegetable Oil and Grease	1	N/A	2018/09/14	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/09/14	2018/09/14	CAM SOP-00326	EPA1664B m,SM5520A m
pH	1	N/A	2018/09/13	CAM SOP-00413	SM 4500H+ B m
pH	3	N/A	2018/09/14	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/09/14	CAM SOP-00444	OMOE E3179 m
Orthophosphate	3	N/A	2018/09/14	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2018/09/17		

Your Project #: 161413684
Site Location: GUELPH, ON
Your C.O.C. #: 111362

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2018/09/19
Report #: R5406235
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8N6455
Received: 2018/09/11, 16:40

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sat. pH and Langelier Index (@ 4C)	3	N/A	2018/09/17		
Sulphate by Automated Colourimetry	1	N/A	2018/09/13	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	3	N/A	2018/09/14	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	3	N/A	2018/09/17		
Total Kjeldahl Nitrogen in Water	1	2018/09/17	2018/09/17	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/09/14	2018/09/14	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	4	2018/09/12	2018/09/13	CAM SOP-00428	SM 23 2540D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Your Project #: 161413684
Site Location: GUELPH, ON
Your C.O.C. #: 111362

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2018/09/19
Report #: R5406235
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8N6455
Received: 2018/09/11, 16:40

Encryption Key

Colby Coutu
Project Manager Assistant
19 Sep 2018 17:12:27

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

THE CITY OF GUELPH SANITARY SEWER BYLAW (WATER)

Maxxam ID		HSJ715			HSJ715		
Sampling Date		2018/09/11 15:05			2018/09/11 15:05		
COC Number		111362			111362		
	UNITS	**WG-161413684-20180911-DS-04**	**RDL**	**QC Batch**	**WG-161413684-20180911-DS-04 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	<0.50	0.50	5724443			
Inorganics							
Total Carbonaceous BOD	mg/L	<2	2	5726645	<2	2	5726645
Fluoride (F-)	mg/L	0.13	0.10	5727841			
Total Kjeldahl Nitrogen (TKN)	mg/L	1.7	0.10	5734882			
pH	pH	7.90		5727848			
Phenols-4AAP	mg/L	<0.0010	0.0010	5729249			
Total Suspended Solids	mg/L	2500	33	5727677			
Dissolved Sulphate (SO4)	mg/L	40	1.0	5727421			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5729123			
Dissolved Chloride (Cl-)	mg/L	46	1.0	5727413			
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	<0.50	0.50	5731988			
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	5732048			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5731153			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

THE CITY OF GUELPH STORM SEWER BYLAW (WATER)

Maxxam ID		HSJ715		
Sampling Date		2018/09/11 15:05		
COC Number		111362		
	UNITS	**WG-161413684-20180911-DS-04**	**RDL**	**QC Batch**
Metals				
Total Aluminum (Al)	mg/L	15	0.025	5728921
Total Antimony (Sb)	mg/L	<0.00050	0.00050	5728921
Total Arsenic (As)	mg/L	0.0062	0.0010	5728921
Total Bismuth (Bi)	mg/L	<0.0010	0.0010	5728921
Total Cadmium (Cd)	mg/L	0.0019	0.00010	5728921
Total Chromium (Cr)	mg/L	0.040	0.0050	5728921
Total Cobalt (Co)	mg/L	0.0096	0.00050	5728921
Total Copper (Cu)	mg/L	0.030	0.0010	5729988
Total Iron (Fe)	mg/L	23	0.10	5728921
Total Lead (Pb)	mg/L	0.13	0.00050	5728921
Total Manganese (Mn)	mg/L	1.3	0.0020	5728921
Total Molybdenum (Mo)	mg/L	0.0032	0.00050	5728921
Total Nickel (Ni)	mg/L	0.021	0.0010	5728921
Total Phosphorus (P)	mg/L	1.1	0.10	5728921
Total Selenium (Se)	mg/L	<0.0020	0.0020	5728921
Total Silver (Ag)	mg/L	<0.00010	0.00010	5728921
Total Tin (Sn)	mg/L	0.0011	0.0010	5728921
Total Titanium (Ti)	mg/L	0.49	0.0050	5728921
Total Vanadium (V)	mg/L	0.031	0.00050	5728921
Total Zinc (Zn)	mg/L	0.64	0.0050	5728921
Microbiological				
Fecal coliform	5TMPN/100mL	350	1.8	5726125
RDL = Reportable Detection Limit QC Batch = Quality Control Batch				

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		HSJ712		HSJ713		
Sampling Date		2018/09/11 12:40		2018/09/11 13:10		
COC Number		111362		111362		
	UNITS	**WG-161413684-20180911-DS-01**	**QC Batch**	**WG-161413684-20180911-DS-02**	**RDL**	**QC Batch**
Calculated Parameters						
Anion Sum	me/L	6.67	5724250	9.30	N/A	5724250
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	300	5724251	330	1.0	5724251
Calculated TDS	mg/L	330	5724255	530	1.0	5724255
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.7	5724251	4.7	1.0	5724251
Cation Sum	me/L	6.66	5724250	11.8	N/A	5724250
Hardness (CaCO3)	mg/L	320	5724254	520	1.0	5724254
Ion Balance (% Difference)	%	0.0500	5724249	12.1	N/A	5724249
Langelier Index (@ 20C)	N/A	1.01	5724252	1.25		5724252
Langelier Index (@ 4C)	N/A	0.762	5724253	0.997		5724253
Saturation pH (@ 20C)	N/A	7.10	5724252	6.93		5724252
Saturation pH (@ 4C)	N/A	7.35	5724253	7.18		5724253
Inorganics						
Total Ammonia-N	mg/L	<0.050	5732437	<0.050	0.050	5732437
Conductivity	umho/cm	580	5727479	830	1.0	5727479
Dissolved Organic Carbon	mg/L	0.83	5727802	1.0	0.50	5727802
Orthophosphate (P)	mg/L	<0.010	5727668	<0.010	0.010	5727668
pH	pH	8.11	5727480	8.18		5727480
Dissolved Sulphate (SO4)	mg/L	15	5727661	84	1.0	5727661
Alkalinity (Total as CaCO3)	mg/L	310	5727466	340	1.0	5738172
Dissolved Chloride (Cl-)	mg/L	7.4	5727647	27	1.0	5738161
Nitrite (N)	mg/L	<0.010	5727425	<0.010	0.010	5727425
Nitrate (N)	mg/L	0.25	5727425	0.12	0.10	5727425
Nitrate + Nitrite (N)	mg/L	0.25	5727425	0.12	0.10	5727425
Metals						
Dissolved Aluminum (Al)	mg/L	<0.0050	5728244	0.063	0.0050	5738013
Dissolved Antimony (Sb)	mg/L	<0.00050	5728244	<0.00050	0.00050	5738013
Dissolved Arsenic (As)	mg/L	<0.0010	5728244	0.0015	0.0010	5738013
Dissolved Barium (Ba)	mg/L	0.032	5728244	0.076	0.0020	5738013
Dissolved Beryllium (Be)	mg/L	<0.00050	5728244	<0.00050	0.00050	5738013
Dissolved Boron (B)	mg/L	0.014	5728244	0.013	0.010	5738013

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		HSJ712		HSJ713		
Sampling Date		2018/09/11 12:40		2018/09/11 13:10		
COC Number		111362		111362		
	UNITS	**WG-161413684-20180911-DS-01**	**QC Batch**	**WG-161413684-20180911-DS-02**	**RDL**	**QC Batch**
Dissolved Cadmium (Cd)	mg/L	<0.00010	5728244	<0.00010	0.00010	5738013
Dissolved Calcium (Ca)	mg/L	69	5728244	100	0.20	5738013
Dissolved Chromium (Cr)	mg/L	<0.0050	5728244	<0.0050	0.0050	5738013
Dissolved Cobalt (Co)	mg/L	<0.00050	5728244	<0.00050	0.00050	5738013
Dissolved Copper (Cu)	mg/L	<0.0010	5728244	<0.0010	0.0010	5738013
Dissolved Iron (Fe)	mg/L	<0.10	5728244	0.19	0.10	5738013
Dissolved Lead (Pb)	mg/L	<0.00050	5728244	0.00056	0.00050	5738013
Dissolved Magnesium (Mg)	mg/L	36	5728244	63	0.050	5738013
Dissolved Manganese (Mn)	mg/L	0.011	5728244	0.046	0.0020	5738013
Dissolved Molybdenum (Mo)	mg/L	0.00079	5728244	0.0030	0.00050	5738013
Dissolved Nickel (Ni)	mg/L	<0.0010	5728244	<0.0010	0.0010	5738013
Dissolved Phosphorus (P)	mg/L	<0.10	5728244	<0.10	0.10	5738013
Dissolved Potassium (K)	mg/L	1.1	5728244	2.6	0.20	5738013
Dissolved Selenium (Se)	mg/L	<0.0020	5728244	<0.0020	0.0020	5738013
Dissolved Silicon (Si)	mg/L	6.3	5728244	7.9	0.050	5738013
Dissolved Silver (Ag)	mg/L	<0.00010	5728244	<0.00010	0.00010	5738013
Dissolved Sodium (Na)	mg/L	5.4	5728244	34	0.10	5738013
Dissolved Strontium (Sr)	mg/L	0.13	5728244	0.20	0.0010	5738013
Dissolved Thallium (Tl)	mg/L	<0.000050	5728244	<0.000050	0.000050	5738013
Dissolved Titanium (Ti)	mg/L	<0.0050	5728244	0.0051	0.0050	5738013
Dissolved Uranium (U)	mg/L	0.00063	5728244	0.0022	0.00010	5738013
Dissolved Vanadium (V)	mg/L	<0.00050	5728244	0.0014	0.00050	5738013
Dissolved Zinc (Zn)	mg/L	<0.0050	5728244	<0.0050	0.0050	5738013

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B8N6455
Report Date: 2018/09/19

Stantec Consulting Ltd
Client Project #: 161413684
Site Location: GUELPH, ON
Sampler Initials: DS

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		HSJ714		
Sampling Date		2018/09/11 13:55		
COC Number		111362		
	UNITS	**WG-161413684-20180911-DS-03**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	10.7	N/A	5724250
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	410	1.0	5724251
Calculated TDS	mg/L	540	1.0	5724255
Carb. Alkalinity (calc. as CaCO3)	mg/L	5.3	1.0	5724251
Cation Sum	me/L	10.9	N/A	5724250
Hardness (CaCO3)	mg/L	490	1.0	5724254
Ion Balance (% Difference)	%	1.08	N/A	5724249
Langelier Index (@ 20C)	N/A	1.20		5724252
Langelier Index (@ 4C)	N/A	0.947		5724253
Saturation pH (@ 20C)	N/A	6.95		5724252
Saturation pH (@ 4C)	N/A	7.20		5724253
Inorganics				
Total Ammonia-N	mg/L	0.071	0.050	5732437
Conductivity	umho/cm	950	1.0	5727479
Dissolved Organic Carbon	mg/L	1.4	0.50	5727802
Orthophosphate (P)	mg/L	0.012	0.010	5727668
pH	pH	8.14		5727480
Dissolved Sulphate (SO4)	mg/L	50	1.0	5727661
Alkalinity (Total as CaCO3)	mg/L	410	1.0	5727466
Dissolved Chloride (Cl-)	mg/L	43	1.0	5727647
Nitrite (N)	mg/L	0.026	0.010	5727425
Nitrate (N)	mg/L	1.93	0.10	5727425
Nitrate + Nitrite (N)	mg/L	1.96	0.10	5727425
Metals				
Dissolved Aluminum (Al)	mg/L	0.0064	0.0050	5728244
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	5728244
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	5728244
Dissolved Barium (Ba)	mg/L	0.13	0.0020	5728244
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	5728244
Dissolved Boron (B)	mg/L	0.11	0.010	5728244

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Stantec Consulting Ltd
Client Project #: 161413684
Site Location: GUELPH, ON
Sampler Initials: DS

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		HSJ714		
Sampling Date		2018/09/11 13:55		
COC Number		111362		
	UNITS	**WG-161413684-20180911-DS-03**	**RDL**	**QC Batch**
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	5728244
Dissolved Calcium (Ca)	mg/L	82	0.20	5728244
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	5728244
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	5728244
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	5728244
Dissolved Iron (Fe)	mg/L	<0.10	0.10	5728244
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	5728244
Dissolved Magnesium (Mg)	mg/L	71	0.050	5728244
Dissolved Manganese (Mn)	mg/L	0.020	0.0020	5728244
Dissolved Molybdenum (Mo)	mg/L	0.0042	0.00050	5728244
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	5728244
Dissolved Phosphorus (P)	mg/L	0.11	0.10	5728244
Dissolved Potassium (K)	mg/L	5.9	0.20	5728244
Dissolved Selenium (Se)	mg/L	0.0022	0.0020	5728244
Dissolved Silicon (Si)	mg/L	5.2	0.050	5728244
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	5728244
Dissolved Sodium (Na)	mg/L	20	0.10	5728244
Dissolved Strontium (Sr)	mg/L	0.23	0.0010	5728244
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	5728244
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	5728244
Dissolved Uranium (U)	mg/L	0.0030	0.00010	5728244
Dissolved Vanadium (V)	mg/L	0.0012	0.00050	5728244
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	5728244

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF WATER

Maxxam ID		HSJ712	HSJ713		HSJ714		
Sampling Date		2018/09/11 12:40	2018/09/11 13:10		2018/09/11 13:55		
COC Number		111362	111362		111362		
	UNITS	**WG-161413684-20180911-DS-01**	**WG-161413684-20180911-DS-02**	**RDL**	**WG-161413684-20180911-DS-03**	**RDL**	**QC Batch**
Inorganics							
Total Suspended Solids	mg/L	1800	1200	25	100	1.3	5727677

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

TEST SUMMARY

Maxxam ID: HSJ712
Sample ID: WG-161413684-20180911-DS-01
Matrix: Water

Collected: 2018/09/11
Shipped:
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5727466	N/A	2018/09/14	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5724251	N/A	2018/09/14	Automated Statchk
Chloride by Automated Colourimetry	KONE	5727647	N/A	2018/09/14	Deonarine Ramnarine
Conductivity	AT	5727479	N/A	2018/09/14	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5727802	N/A	2018/09/14	Shivani Shivani
Hardness (calculated as CaCO3)		5724254	N/A	2018/09/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5728244	N/A	2018/09/17	Arefa Dabhad
Ion Balance (% Difference)	CALC	5724249	N/A	2018/09/17	Automated Statchk
Anion and Cation Sum	CALC	5724250	N/A	2018/09/17	Automated Statchk
Total Ammonia-N	LACH/NH4	5732437	N/A	2018/09/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5727425	N/A	2018/09/13	Chandra Nandlal
pH	AT	5727480	N/A	2018/09/14	Surinder Rai
Orthophosphate	KONE	5727668	N/A	2018/09/14	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5724252	N/A	2018/09/17	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5724253	N/A	2018/09/17	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5727661	N/A	2018/09/14	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	5724255	N/A	2018/09/17	Automated Statchk
Total Suspended Solids	BAL	5727677	2018/09/12	2018/09/13	Jingwei (Alvin) Shi

Maxxam ID: HSJ713
Sample ID: WG-161413684-20180911-DS-02
Matrix: Water

Collected: 2018/09/11
Shipped:
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5738172	N/A	2018/09/19	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5724251	N/A	2018/09/14	Automated Statchk
Chloride by Automated Colourimetry	KONE	5738161	N/A	2018/09/19	Deonarine Ramnarine
Conductivity	AT	5727479	N/A	2018/09/14	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5727802	N/A	2018/09/14	Shivani Shivani
Hardness (calculated as CaCO3)		5724254	N/A	2018/09/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5738013	N/A	2018/09/19	Thao Nguyen
Ion Balance (% Difference)	CALC	5724249	N/A	2018/09/17	Automated Statchk
Anion and Cation Sum	CALC	5724250	N/A	2018/09/17	Automated Statchk
Total Ammonia-N	LACH/NH4	5732437	N/A	2018/09/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5727425	N/A	2018/09/13	Chandra Nandlal
pH	AT	5727480	N/A	2018/09/14	Surinder Rai
Orthophosphate	KONE	5727668	N/A	2018/09/14	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5724252	N/A	2018/09/17	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5724253	N/A	2018/09/17	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5727661	N/A	2018/09/14	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	5724255	N/A	2018/09/17	Automated Statchk
Total Suspended Solids	BAL	5727677	2018/09/12	2018/09/13	Jingwei (Alvin) Shi

TEST SUMMARY

Maxxam ID: HSJ714
Sample ID: WG-161413684-20180911-DS-03
Matrix: Water

Collected: 2018/09/11
Shipped:
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5727466	N/A	2018/09/14	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5724251	N/A	2018/09/14	Automated Statchk
Chloride by Automated Colourimetry	KONE	5727647	N/A	2018/09/14	Deonarine Ramnarine
Conductivity	AT	5727479	N/A	2018/09/14	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5727802	N/A	2018/09/14	Shivani Shivani
Hardness (calculated as CaCO3)		5724254	N/A	2018/09/17	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5728244	N/A	2018/09/14	Arefa Dabhad
Ion Balance (% Difference)	CALC	5724249	N/A	2018/09/17	Automated Statchk
Anion and Cation Sum	CALC	5724250	N/A	2018/09/17	Automated Statchk
Total Ammonia-N	LACH/NH4	5732437	N/A	2018/09/18	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5727425	N/A	2018/09/13	Chandra Nandlal
pH	AT	5727480	N/A	2018/09/14	Surinder Rai
Orthophosphate	KONE	5727668	N/A	2018/09/14	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5724252	N/A	2018/09/17	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5724253	N/A	2018/09/17	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5727661	N/A	2018/09/14	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	5724255	N/A	2018/09/17	Automated Statchk
Total Suspended Solids	BAL	5727677	2018/09/12	2018/09/13	Jingwei (Alvin) Shi

Maxxam ID: HSJ715
Sample ID: WG-161413684-20180911-DS-04
Matrix: Water

Collected: 2018/09/11
Shipped:
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonaceous BOD	DO	5726645	2018/09/12	2018/09/17	Frank Zhang
Chloride by Automated Colourimetry	KONE	5727413	N/A	2018/09/13	Alina Dobreanu
Total Cyanide	SKAL/CN	5729123	2018/09/13	2018/09/13	Xuanhong Qiu
Fluoride	ISE	5727841	2018/09/12	2018/09/13	Surinder Rai
Mercury in Water by CVAA	CV/AA	5731153	2018/09/14	2018/09/14	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5728921	N/A	2018/09/13	Arefa Dabhad
Fecal coliform, (5TMPN/100mL)	INC	5726125	N/A	2018/09/11	Sirimathie Aluthwala
Animal and Vegetable Oil and Grease	BAL	5724443	N/A	2018/09/14	Automated Statchk
Total Oil and Grease	BAL	5731988	2018/09/14	2018/09/14	Amjad Mir
pH	AT	5727848	N/A	2018/09/13	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5729249	N/A	2018/09/14	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5727421	N/A	2018/09/13	Alina Dobreanu
Total Kjeldahl Nitrogen in Water	SKAL	5734882	2018/09/17	2018/09/17	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5732048	2018/09/14	2018/09/14	Amjad Mir
Total Suspended Solids	BAL	5727677	2018/09/12	2018/09/13	Jingwei (Alvin) Shi

TEST SUMMARY

Maxxam ID: HSJ715 Dup
Sample ID: WG-161413684-20180911-DS-04
Matrix: Water

Collected: 2018/09/11
Shipped:
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonaceous BOD	DO	5726645	2018/09/12	2018/09/17	Frank Zhang

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.7°C

Sample HSJ713 [WG-161413684-20180911-DS-02] : Elevated ion balance result was confirmed by re-analysis.

Sample HSJ715, Total Metals Analysis by ICPMS: Test repeated.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5726645	Total Carbonaceous BOD	2018/09/17					<2	mg/L	NC	30	98	85 - 115
5727413	Dissolved Chloride (Cl-)	2018/09/13	NC	80 - 120	104	80 - 120	<1.0	mg/L	0.80	20		
5727421	Dissolved Sulphate (SO4)	2018/09/13	NC	75 - 125	97	80 - 120	<1.0	mg/L	0.58	20		
5727425	Nitrate (N)	2018/09/13	89	80 - 120	102	80 - 120	<0.10	mg/L	NC	20		
5727425	Nitrite (N)	2018/09/13	104	80 - 120	104	80 - 120	<0.010	mg/L	NC	20		
5727466	Alkalinity (Total as CaCO3)	2018/09/14			97	85 - 115	<1.0	mg/L	0.90	20		
5727479	Conductivity	2018/09/14			101	85 - 115	<1.0	umho/cm	0.36	25		
5727480	pH	2018/09/14			101	98 - 103			0.24	N/A		
5727647	Dissolved Chloride (Cl-)	2018/09/14	114	80 - 120	101	80 - 120	<1.0	mg/L	13	20		
5727661	Dissolved Sulphate (SO4)	2018/09/14	104	75 - 125	103	80 - 120	<1.0	mg/L	0.21	20		
5727668	Orthophosphate (P)	2018/09/14	109	75 - 125	99	80 - 120	<0.010	mg/L	NC	25		
5727677	Total Suspended Solids	2018/09/13					<10	mg/L	NC	25	95	85 - 115
5727802	Dissolved Organic Carbon	2018/09/14	95	80 - 120	98	80 - 120	<0.50	mg/L	5.0	20		
5727841	Fluoride (F-)	2018/09/13	97	80 - 120	99	80 - 120	<0.10	mg/L	6.7	20		
5727848	pH	2018/09/13			102	98 - 103			0.24	N/A		
5728244	Dissolved Aluminum (Al)	2018/09/14	102	80 - 120	100	80 - 120	<0.0050	mg/L				
5728244	Dissolved Antimony (Sb)	2018/09/14	105	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20		
5728244	Dissolved Arsenic (As)	2018/09/14	101	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5728244	Dissolved Barium (Ba)	2018/09/14	102	80 - 120	100	80 - 120	<0.0020	mg/L	1.7	20		
5728244	Dissolved Beryllium (Be)	2018/09/14	112	80 - 120	105	80 - 120	<0.00050	mg/L	NC	20		
5728244	Dissolved Boron (B)	2018/09/14	112	80 - 120	104	80 - 120	<0.010	mg/L	NC	20		
5728244	Dissolved Cadmium (Cd)	2018/09/14	103	80 - 120	101	80 - 120	<0.00010	mg/L	NC	20		
5728244	Dissolved Calcium (Ca)	2018/09/14	NC	80 - 120	94	80 - 120	<0.20	mg/L				
5728244	Dissolved Chromium (Cr)	2018/09/14	99	80 - 120	94	80 - 120	<0.0050	mg/L	NC	20		
5728244	Dissolved Cobalt (Co)	2018/09/14	95	80 - 120	96	80 - 120	<0.00050	mg/L	NC	20		
5728244	Dissolved Copper (Cu)	2018/09/14	101	80 - 120	96	80 - 120	<0.0010	mg/L	NC	20		
5728244	Dissolved Iron (Fe)	2018/09/14	103	80 - 120	101	80 - 120	<0.10	mg/L				
5728244	Dissolved Lead (Pb)	2018/09/14	99	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
5728244	Dissolved Magnesium (Mg)	2018/09/14	106	80 - 120	102	80 - 120	<0.050	mg/L				
5728244	Dissolved Manganese (Mn)	2018/09/14	100	80 - 120	98	80 - 120	<0.0020	mg/L				

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5728244	Dissolved Molybdenum (Mo)	2018/09/14	105	80 - 120	103	80 - 120	<0.00050	mg/L	8.3	20		
5728244	Dissolved Nickel (Ni)	2018/09/14	96	80 - 120	95	80 - 120	<0.0010	mg/L	3.1	20		
5728244	Dissolved Phosphorus (P)	2018/09/14	115	80 - 120	116	80 - 120	<0.10	mg/L				
5728244	Dissolved Potassium (K)	2018/09/14	106	80 - 120	104	80 - 120	<0.20	mg/L				
5728244	Dissolved Selenium (Se)	2018/09/14	99	80 - 120	99	80 - 120	<0.0020	mg/L	NC	20		
5728244	Dissolved Silicon (Si)	2018/09/14	100	80 - 120	102	80 - 120	<0.050	mg/L				
5728244	Dissolved Silver (Ag)	2018/09/14	98	80 - 120	98	80 - 120	<0.00010	mg/L	NC	20		
5728244	Dissolved Sodium (Na)	2018/09/14	NC	80 - 120	101	80 - 120	<0.10	mg/L	3.9	20		
5728244	Dissolved Strontium (Sr)	2018/09/14	101	80 - 120	98	80 - 120	<0.0010	mg/L				
5728244	Dissolved Thallium (Tl)	2018/09/14	100	80 - 120	97	80 - 120	<0.000050	mg/L	NC	20		
5728244	Dissolved Titanium (Ti)	2018/09/14	105	80 - 120	103	80 - 120	<0.0050	mg/L				
5728244	Dissolved Uranium (U)	2018/09/14	102	80 - 120	101	80 - 120	<0.00010	mg/L	4.9	20		
5728244	Dissolved Vanadium (V)	2018/09/14	97	80 - 120	93	80 - 120	<0.00050	mg/L	NC	20		
5728244	Dissolved Zinc (Zn)	2018/09/14	98	80 - 120	97	80 - 120	<0.0050	mg/L	4.0	20		
5728921	Total Aluminum (Al)	2018/09/13	112	80 - 120	101	80 - 120	0.0062, RDL=0.0050	mg/L	0.18	20		
5728921	Total Antimony (Sb)	2018/09/13	101	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
5728921	Total Arsenic (As)	2018/09/13	99	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5728921	Total Bismuth (Bi)	2018/09/13	89	80 - 120	91	80 - 120	<0.0010	mg/L	NC	20		
5728921	Total Cadmium (Cd)	2018/09/13	100	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20		
5728921	Total Chromium (Cr)	2018/09/13	98	80 - 120	95	80 - 120	<0.0050	mg/L	NC	20		
5728921	Total Cobalt (Co)	2018/09/13	99	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20		
5728921	Total Iron (Fe)	2018/09/13	99	80 - 120	98	80 - 120	<0.10	mg/L	1.5	20		
5728921	Total Lead (Pb)	2018/09/13	92	80 - 120	92	80 - 120	<0.00050	mg/L	1.7	20		
5728921	Total Manganese (Mn)	2018/09/13	95	80 - 120	96	80 - 120	<0.0020	mg/L	2.3	20		
5728921	Total Molybdenum (Mo)	2018/09/13	97	80 - 120	100	80 - 120	<0.00050	mg/L	3.9	20		
5728921	Total Nickel (Ni)	2018/09/13	91	80 - 120	92	80 - 120	<0.0010	mg/L	NC	20		
5728921	Total Phosphorus (P)	2018/09/13	NC	80 - 120	111	80 - 120	<0.10	mg/L				
5728921	Total Selenium (Se)	2018/09/13	105	80 - 120	105	80 - 120	<0.0020	mg/L	NC	20		
5728921	Total Silver (Ag)	2018/09/13	95	80 - 120	95	80 - 120	<0.00010	mg/L	NC	20		
5728921	Total Tin (Sn)	2018/09/13	98	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5728921	Total Titanium (Ti)	2018/09/13	96	80 - 120	98	80 - 120	<0.0050	mg/L	6.5	20		
5728921	Total Vanadium (V)	2018/09/13	94	80 - 120	94	80 - 120	<0.00050	mg/L	7.8	20		
5728921	Total Zinc (Zn)	2018/09/13	99	80 - 120	100	80 - 120	<0.0050	mg/L	1.6	20		
5729123	Total Cyanide (CN)	2018/09/13	85	80 - 120	97	80 - 120	<0.0050	mg/L	1.6	20		
5729249	Phenols-4AAP	2018/09/13	93	80 - 120	94	80 - 120	<0.0010	mg/L	NC	20		
5729988	Total Copper (Cu)	2018/09/14	102	80 - 120	103	80 - 120	<0.0010	mg/L	NC	20		
5731153	Mercury (Hg)	2018/09/14	95	75 - 125	92	80 - 120	<0.0001	mg/L	NC	20		
5731988	Total Oil & Grease	2018/09/14	91	75 - 125	96	85 - 115	<0.50	mg/L	1.6	25		
5732048	Total Oil & Grease Mineral/Synthetic	2018/09/14	93	75 - 125	92	85 - 115	<0.50	mg/L	2.7	25		
5732437	Total Ammonia-N	2018/09/18	101	75 - 125	102	80 - 120	<0.050	mg/L	NC	20		
5734882	Total Kjeldahl Nitrogen (TKN)	2018/09/17	98	80 - 120	100	80 - 120	<0.10	mg/L	1.7	20	99	80 - 120
5738013	Dissolved Aluminum (Al)	2018/09/19	105	80 - 120	99	80 - 120	<0.0050	mg/L				
5738013	Dissolved Antimony (Sb)	2018/09/19	110	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
5738013	Dissolved Arsenic (As)	2018/09/19	103	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5738013	Dissolved Barium (Ba)	2018/09/19	107	80 - 120	99	80 - 120	<0.0020	mg/L	1.1	20		
5738013	Dissolved Beryllium (Be)	2018/09/19	99	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
5738013	Dissolved Boron (B)	2018/09/19	104	80 - 120	100	80 - 120	<0.010	mg/L	0.083	20		
5738013	Dissolved Cadmium (Cd)	2018/09/19	98	80 - 120	98	80 - 120	<0.00010	mg/L	NC	20		
5738013	Dissolved Calcium (Ca)	2018/09/19	NC	80 - 120	99	80 - 120	<0.20	mg/L				
5738013	Dissolved Chromium (Cr)	2018/09/19	100	80 - 120	97	80 - 120	<0.0050	mg/L	NC	20		
5738013	Dissolved Cobalt (Co)	2018/09/19	99	80 - 120	97	80 - 120	<0.00050	mg/L	3.6	20		
5738013	Dissolved Copper (Cu)	2018/09/19	104	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
5738013	Dissolved Iron (Fe)	2018/09/19	104	80 - 120	100	80 - 120	<0.10	mg/L				
5738013	Dissolved Lead (Pb)	2018/09/19	90	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20		
5738013	Dissolved Magnesium (Mg)	2018/09/19	NC	80 - 120	99	80 - 120	<0.050	mg/L				
5738013	Dissolved Manganese (Mn)	2018/09/19	101	80 - 120	98	80 - 120	<0.0020	mg/L				
5738013	Dissolved Molybdenum (Mo)	2018/09/19	113	80 - 120	101	80 - 120	<0.00050	mg/L	1.9	20		
5738013	Dissolved Nickel (Ni)	2018/09/19	95	80 - 120	96	80 - 120	<0.0010	mg/L	7.9	20		
5738013	Dissolved Phosphorus (P)	2018/09/19	116	80 - 120	118	80 - 120	<0.10	mg/L				
5738013	Dissolved Potassium (K)	2018/09/19	108	80 - 120	99	80 - 120	<0.20	mg/L				
5738013	Dissolved Selenium (Se)	2018/09/19	99	80 - 120	100	80 - 120	<0.0020	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5738013	Dissolved Silicon (Si)	2018/09/19	107	80 - 120	101	80 - 120	<0.050	mg/L				
5738013	Dissolved Silver (Ag)	2018/09/19	96	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20		
5738013	Dissolved Sodium (Na)	2018/09/19	NC	80 - 120	97	80 - 120	<0.10	mg/L	1.4	20		
5738013	Dissolved Strontium (Sr)	2018/09/19	NC	80 - 120	97	80 - 120	<0.0010	mg/L				
5738013	Dissolved Thallium (Tl)	2018/09/19	90	80 - 120	96	80 - 120	<0.000050	mg/L	NC	20		
5738013	Dissolved Titanium (Ti)	2018/09/19	110	80 - 120	101	80 - 120	<0.0050	mg/L				
5738013	Dissolved Uranium (U)	2018/09/19	96	80 - 120	100	80 - 120	<0.00010	mg/L	1.8	20		
5738013	Dissolved Vanadium (V)	2018/09/19	106	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20		
5738013	Dissolved Zinc (Zn)	2018/09/19	90	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20		
5738161	Dissolved Chloride (Cl-)	2018/09/19	115	80 - 120	102	80 - 120	<1.0	mg/L	5.6	20		
5738172	Alkalinity (Total as CaCO3)	2018/09/19			96	85 - 115	<1.0	mg/L	1.2	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Service Specialist

Sirimathie Aluthwala, Campobello Micro

Maxxam MICRO
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD 111362

Page 1 of 1

Invoice Information

Company Name: Stantec
Contact Name: Grant Whitehead
Address:
Phone: Fax:
Email: Grant.whitehead@stantec.com

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #: Stantec 2015-2018
P.O. # AFE#:
Project #: 16413684
Site Location: Guelph, ON
Site #:
Sampled By: Drew Smith

Turnaround Time (TAT) Required

☒ Regular TAT (5-7 days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
☐ 1 Day ☐ 2 Days ☐ 3-4 Days

Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
FOR RSC (PLEASE CIRCLE) Y / N

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ MISA ☐ Storm Sewer Bylaw
☒ PWQO Region
☒ Other (Specify) ODWS
☐ REG 558 (MIN 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) (Metals) / Hg / Cr VI	GCAq comprehensive	Guelph Sewer [illegible]	TSS	HOLD - DO NOT ANALYZE
1	WG-161413684-20180911-DS-01	2018/09/11	12 40	GW		X	X		X	
2	WG-161413684-20180911-DS-02	2018/09/11	13:10	GW		X	X		X	
3	WG-161413684-20180911-DS-03	2018/09/11	13:55	GW		X	X		X	
4	WG-161413684-20180911-DS-04	2018/09/11	15:15	GW				X		
5										
6										
7										
8										
9										
10										

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY (Signature/Print)	DATE (YYYY/MM/DD)	TIME (HH:MM)	RECEIVED BY (Signature/Print)	DATE (YYYY/MM/DD)	TIME (HH:MM)
Drew Smith	2018/09/11	16 42			
			[illegible]	2018/09/11	[illegible]

REC'D IN WATERLOO
11-Sep-18 16:40
Augustyna Dobosz
B8N6455
VMK ENV-1263

Your Project #: 161413684
Your C.O.C. #: 686036-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA . N2L 0A4

Report Date: 2018/11/14
Report #: R5484375
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8T9171
Received: 2018/11/08, 14:50

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	4	N/A	2018/11/10	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	4	N/A	2018/11/12	CAM SOP-00102	APHA 4500-CO2 D
Carbonaceous BOD	1	2018/11/09	2018/11/14	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	5	N/A	2018/11/12	CAM SOP-00463	EPA 325.2 m
Conductivity	4	N/A	2018/11/10	CAM SOP-00414	SM 23 2510 m
Total Cyanide	1	2018/11/12	2018/11/13	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2018/11/12	CAM SOP-00446	SM 23 5310 B m
Fluoride	1	2018/11/10	2018/11/13	CAM SOP-00449	SM 23 4500-F C m
Hardness (calculated as CaCO3)	4	N/A	2018/11/13	CAM SOP 00102/00408/00447	SM 2340 B
Mercury in Water by CVAA	1	2018/11/14	2018/11/14	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	5	N/A	2018/11/12	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2018/11/12	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	4	N/A	2018/11/13		
Anion and Cation Sum	4	N/A	2018/11/13		
Fecal coliform, (5TMPN/100mL)	1	N/A	2018/11/08	BBY4 SOP-000127	MFHPB-19
Total Ammonia-N	3	N/A	2018/11/12	CAM SOP-00441	EPA GS I-2522-90 m
Total Ammonia-N	1	N/A	2018/11/13	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	4	N/A	2018/11/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Animal and Vegetable Oil and Grease	1	N/A	2018/11/13	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/11/13	2018/11/13	CAM SOP-00326	EPA1664B m,SM5520A m
pH	4	N/A	2018/11/10	CAM SOP-00413	SM 4500H+ B m
pH	1	N/A	2018/11/12	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/11/13	CAM SOP-00444	OMOE E3179 m
Orthophosphate	4	N/A	2018/11/12	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	4	N/A	2018/11/13		
Sat. pH and Langelier Index (@ 4C)	4	N/A	2018/11/13		
Sulphate by Automated Colourimetry	5	N/A	2018/11/12	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	4	N/A	2018/11/13		
Total Kjeldahl Nitrogen in Water	1	2018/11/10	2018/11/12	CAM SOP-00938	OMOE E3516 m

Your Project #: 161413684
Your C.O.C. #: 686036-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2018/11/14
Report #: R5484375
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8T9171
Received: 2018/11/08, 14:50

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/11/13	2018/11/13	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	5	2018/11/09	2018/11/12	CAM SOP-00428	SM 23 2540D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Your Project #: 161413684
Your C.O.C. #: 686036-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2018/11/14
Report #: R5484375
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8T9171
Received: 2018/11/08, 14:50

Encryption Key

Colby Coutu
Project Manager Assistant
14 Nov 2018 17:01:42

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

THE CITY OF GUELPH SANITARY SEWER BYLAW (WATER)

Maxxam ID		IGE068		
Sampling Date		2018/11/08 11:30		
COC Number		686036-01-01		
	UNITS	WG-161413684-20181108-DS01	RDL	QC Batch
Calculated Parameters				
Total Animal/Vegetable Oil and Grease	mg/L	3.3	0.50	5827390
Inorganics				
Total Carbonaceous BOD	mg/L	<2	2	5829310
Fluoride (F-)	mg/L	0.12	0.10	5831501
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	5831642
pH	pH	7.69		5831504
Phenols-4AAP	mg/L	<0.0010	0.0010	5832393
Total Suspended Solids	mg/L	4800	17	5830227
Dissolved Sulphate (SO4)	mg/L	44	1.0	5831429
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5832812
Dissolved Chloride (Cl-)	mg/L	38	1.0	5831425
Petroleum Hydrocarbons				
Total Oil & Grease	mg/L	3.3	0.50	5833748
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	5833755
Metals				
Mercury (Hg)	mg/L	<0.0001	0.0001	5836000

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B8T9171
Report Date: 2018/11/14

Stantec Consulting Ltd
Client Project #: 161413684
Sampler Initials: DS

THE CITY OF GUELPH STORM SEWER BYLAW (WATER)

Maxxam ID		IGE068		
Sampling Date		2018/11/08 11:30		
COC Number		686036-01-01		
	UNITS	**WG-161413684-20181108-DS01**	**RDL**	**QC Batch**
Metals				
Total Aluminum (Al)	mg/L	7.4	0.0050	5831797
Total Antimony (Sb)	mg/L	<0.00050	0.00050	5831797
Total Arsenic (As)	mg/L	0.0038	0.0010	5831797
Total Bismuth (Bi)	mg/L	<0.0010	0.0010	5831797
Total Cadmium (Cd)	mg/L	0.00024	0.00010	5831797
Total Chromium (Cr)	mg/L	0.019	0.0050	5831797
Total Cobalt (Co)	mg/L	0.0040	0.00050	5831797
Total Copper (Cu)	mg/L	0.011	0.0010	5831797
Total Iron (Fe)	mg/L	10	0.10	5831797
Total Lead (Pb)	mg/L	0.030	0.00050	5831797
Total Manganese (Mn)	mg/L	0.40	0.0020	5831797
Total Molybdenum (Mo)	mg/L	0.0040	0.00050	5831797
Total Nickel (Ni)	mg/L	0.0089	0.0010	5831797
Total Phosphorus (P)	mg/L	0.41	0.10	5831797
Total Selenium (Se)	mg/L	<0.0020	0.0020	5831797
Total Silver (Ag)	mg/L	<0.00010	0.00010	5831797
Total Tin (Sn)	mg/L	0.0015	0.0010	5831797
Total Titanium (Ti)	mg/L	0.22	0.0050	5831797
Total Vanadium (V)	mg/L	0.016	0.00050	5831797
Total Zinc (Zn)	mg/L	0.098	0.0050	5831797
Microbiological				
Fecal coliform	5TMPN/100mL	<1.8	1.8	5828861

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		IGE069	IGE070	IGE071		
Sampling Date		2018/11/08 12:40	2018/11/08 13:15	2018/11/08 13:20		
COC Number		686036-01-01	686036-01-01	686036-01-01		
	UNITS	**WG-161413684-20181108-DS02**	**WG-161413684-20181108-DS03**	**WG-161413684-20181108-DS04**	**RDL**	**QC Batch**
Calculated Parameters						
Anion Sum	me/L	8.98	7.31	6.51	N/A	5827281
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	230	310	240	1.0	5827280
Calculated TDS	mg/L	460	350	330	1.0	5827284
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.2	3.2	4.1	1.0	5827280
Cation Sum	me/L	9.29	7.10	5.93	N/A	5827281
Hardness (CaCO3)	mg/L	380	330	190	1.0	5827179
Ion Balance (% Difference)	%	1.72	1.43	4.65	N/A	5827180
Langelier Index (@ 20C)	N/A	0.601	0.775	0.477		5827282
Langelier Index (@ 4C)	N/A	0.352	0.526	0.228		5827283
Saturation pH (@ 20C)	N/A	7.57	7.27	7.78		5827282
Saturation pH (@ 4C)	N/A	7.82	7.52	8.03		5827283
Inorganics						
Total Ammonia-N	mg/L	0.23	<0.050	<0.050	0.050	5831662
Conductivity	umho/cm	840	630	590	1.0	5830552
Dissolved Organic Carbon	mg/L	1.4	0.98	0.68	0.50	5830640
Orthophosphate (P)	mg/L	<0.010	0.012	0.027	0.010	5830606
pH	pH	8.17	8.04	8.26		5830556
Dissolved Sulphate (SO4)	mg/L	20	20	54	1.0	5830605
Alkalinity (Total as CaCO3)	mg/L	240	310	250	1.0	5830538
Dissolved Chloride (Cl-)	mg/L	140	18	17	1.0	5830597
Nitrite (N)	mg/L	<0.010	0.074	<0.010	0.010	5830573
Nitrate (N)	mg/L	<0.10	1.01	<0.10	0.10	5830573
Nitrate + Nitrite (N)	mg/L	<0.10	1.08	<0.10	0.10	5830573
Metals						
Dissolved Aluminum (Al)	mg/L	0.25	0.0071	0.0071	0.0050	5828185
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00051	<0.00050	0.00050	5828185
Dissolved Arsenic (As)	mg/L	<0.0010	<0.0010	0.0044	0.0010	5828185
Dissolved Barium (Ba)	mg/L	0.046	0.088	0.024	0.0020	5828185
Dissolved Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	5828185
Dissolved Boron (B)	mg/L	0.071	0.047	0.036	0.010	5828185
Dissolved Cadmium (Cd)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	5828185

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		IGE069	IGE070	IGE071		
Sampling Date		2018/11/08 12:40	2018/11/08 13:15	2018/11/08 13:20		
COC Number		686036-01-01	686036-01-01	686036-01-01		
	UNITS	**WG-161413684-20181108-DS02**	**WG-161413684-20181108-DS03**	**WG-161413684-20181108-DS04**	**RDL**	**QC Batch**
Dissolved Calcium (Ca)	mg/L	33	47	18	0.20	5828185
Dissolved Chromium (Cr)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	5828185
Dissolved Cobalt (Co)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	5828185
Dissolved Copper (Cu)	mg/L	<0.0010	0.0015	<0.0010	0.0010	5828185
Dissolved Iron (Fe)	mg/L	0.33	<0.10	<0.10	0.10	5828185
Dissolved Lead (Pb)	mg/L	0.0020	<0.00050	<0.00050	0.00050	5828185
Dissolved Magnesium (Mg)	mg/L	73	51	35	0.050	5828185
Dissolved Manganese (Mn)	mg/L	0.030	0.012	<0.0020	0.0020	5828185
Dissolved Molybdenum (Mo)	mg/L	0.027	0.010	0.019	0.00050	5828185
Dissolved Nickel (Ni)	mg/L	0.0021	<0.0010	0.0011	0.0010	5828185
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	0.10	5828185
Dissolved Potassium (K)	mg/L	5.1	7.5	3.0	0.20	5828185
Dissolved Selenium (Se)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	5828185
Dissolved Silicon (Si)	mg/L	5.9	3.9	4.3	0.050	5828185
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	5828185
Dissolved Sodium (Na)	mg/L	33	7.7	47	0.10	5828185
Dissolved Strontium (Sr)	mg/L	0.21	0.15	0.27	0.0010	5828185
Dissolved Thallium (Tl)	mg/L	<0.000050	<0.000050	<0.000050	0.000050	5828185
Dissolved Titanium (Ti)	mg/L	0.012	<0.0050	<0.0050	0.0050	5828185
Dissolved Uranium (U)	mg/L	0.00050	0.0017	0.0010	0.00010	5828185
Dissolved Vanadium (V)	mg/L	0.00084	0.0012	0.0014	0.00050	5828185
Dissolved Zinc (Zn)	mg/L	0.0062	<0.0050	<0.0050	0.0050	5828185

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		IGE072		
Sampling Date		2018/11/08 13:45		
COC Number		686036-01-01		
	UNITS	**WG-161413684-20181108-DS05**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	13.3	N/A	5827281
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	290	1.0	5827280
Calculated TDS	mg/L	700	1.0	5827284
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.4	1.0	5827280
Cation Sum	me/L	13.2	N/A	5827281
Hardness (CaCO3)	mg/L	470	1.0	5827179
Ion Balance (% Difference)	%	0.280	N/A	5827180
Langelier Index (@ 20C)	N/A	0.753		5827282
Langelier Index (@ 4C)	N/A	0.506		5827283
Saturation pH (@ 20C)	N/A	7.18		5827282
Saturation pH (@ 4C)	N/A	7.43		5827283
Inorganics				
Total Ammonia-N	mg/L	0.13	0.050	5831661
Conductivity	umho/cm	1300	1.0	5830552
Dissolved Organic Carbon	mg/L	1.0	0.50	5830640
Orthophosphate (P)	mg/L	0.012	0.010	5830606
pH	pH	7.94		5830556
Dissolved Sulphate (SO4)	mg/L	84	1.0	5830605
Alkalinity (Total as CaCO3)	mg/L	300	1.0	5830538
Dissolved Chloride (Cl-)	mg/L	200	2.0	5830597
Nitrite (N)	mg/L	<0.010	0.010	5830573
Nitrate (N)	mg/L	<0.10	0.10	5830573
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	5830573
Metals				
Dissolved Aluminum (Al)	mg/L	<0.0050	0.0050	5828185
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	5828185
Dissolved Arsenic (As)	mg/L	0.0011	0.0010	5828185
Dissolved Barium (Ba)	mg/L	0.089	0.0020	5828185
Dissolved Beryllium (Be)	mg/L	<0.00050	0.00050	5828185
Dissolved Boron (B)	mg/L	0.069	0.010	5828185
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	5828185

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		IGE072		
Sampling Date		2018/11/08 13:45		
COC Number		686036-01-01		
	UNITS	**WG-161413684-20181108-DS05**	**RDL**	**QC Batch**
Dissolved Calcium (Ca)	mg/L	71	0.20	5828185
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	5828185
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	5828185
Dissolved Copper (Cu)	mg/L	0.0016	0.0010	5828185
Dissolved Iron (Fe)	mg/L	<0.10	0.10	5828185
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	5828185
Dissolved Magnesium (Mg)	mg/L	71	0.050	5828185
Dissolved Manganese (Mn)	mg/L	0.021	0.0020	5828185
Dissolved Molybdenum (Mo)	mg/L	0.012	0.00050	5828185
Dissolved Nickel (Ni)	mg/L	0.0015	0.0010	5828185
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	5828185
Dissolved Potassium (K)	mg/L	5.6	0.20	5828185
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	5828185
Dissolved Silicon (Si)	mg/L	5.0	0.050	5828185
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	5828185
Dissolved Sodium (Na)	mg/L	84	0.10	5828185
Dissolved Strontium (Sr)	mg/L	0.26	0.0010	5828185
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	5828185
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	5828185
Dissolved Uranium (U)	mg/L	0.0027	0.00010	5828185
Dissolved Vanadium (V)	mg/L	0.0012	0.00050	5828185
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	5828185

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF WATER

Maxxam ID		IGE069		IGE070		IGE071		
Sampling Date		2018/11/08 12:40		2018/11/08 13:15		2018/11/08 13:20		
COC Number		686036-01-01		686036-01-01		686036-01-01		
	UNITS	**WG-161413684-20181108-DS02**	**RDL**	**WG-161413684-20181108-DS03**	**RDL**	**WG-161413684-20181108-DS04**	**RDL**	**QC Batch**
Inorganics								
Total Suspended Solids	mg/L	3000	20	630	10	2400	20	5830227

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		IGE072		
Sampling Date		2018/11/08 13:45		
COC Number		686036-01-01		
	UNITS	**WG-161413684-20181108-DS05**	**RDL**	**QC Batch**
Inorganics				
Total Suspended Solids	mg/L	1400	10	5830227

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		IGE068		
Sampling Date		2018/11/08 11:30		
COC Number		686036-01-01		
	UNITS	**WG-161413684-20181108-DS01**	**RDL**	**QC Batch**
Metals				
Dissolved Aluminum (Al)	mg/L	<0.0050	0.0050	5828185
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	5828185
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	5828185
Dissolved Bismuth (Bi)	mg/L	<0.0010	0.0010	5828185
Dissolved Cadmium (Cd)	mg/L	<0.00010	0.00010	5828185
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	5828185
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	5828185
Dissolved Copper (Cu)	mg/L	0.0012	0.0010	5828185
Dissolved Iron (Fe)	mg/L	<0.10	0.10	5828185
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	5828185
Dissolved Manganese (Mn)	mg/L	0.019	0.0020	5828185
Dissolved Molybdenum (Mo)	mg/L	0.0027	0.00050	5828185
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	5828185
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	5828185
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	5828185
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	5828185
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	5828185
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	5828185
Dissolved Vanadium (V)	mg/L	0.0015	0.00050	5828185
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	5828185

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

TEST SUMMARY

Maxxam ID: IGE068
Sample ID: WG-161413684-20181108-DS01
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonaceous BOD	DO	5829310	2018/11/09	2018/11/14	Althea Gonzalez
Chloride by Automated Colourimetry	KONE	5831425	N/A	2018/11/12	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5832812	2018/11/12	2018/11/13	Xuanhong Qiu
Fluoride	ISE	5831501	2018/11/10	2018/11/13	Surinder Rai
Mercury in Water by CVAA	CV/AA	5836000	2018/11/14	2018/11/14	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5828185	N/A	2018/11/12	Thao Nguyen
Total Metals Analysis by ICPMS	ICP/MS	5831797	N/A	2018/11/12	Arefa Dabhad
Fecal coliform, (5TMPN/100mL)	INC	5828861	N/A	2018/11/08	Sirimathie Aluthwala
Animal and Vegetable Oil and Grease	BAL	5827390	N/A	2018/11/13	Automated Statchk
Total Oil and Grease	BAL	5833748	2018/11/13	2018/11/13	Francis Afonso
pH	AT	5831504	N/A	2018/11/12	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5832393	N/A	2018/11/13	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5831429	N/A	2018/11/12	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5831642	2018/11/10	2018/11/12	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5833755	2018/11/13	2018/11/13	Francis Afonso
Total Suspended Solids	BAL	5830227	2018/11/09	2018/11/12	Nilam Borole

Maxxam ID: IGE069
Sample ID: WG-161413684-20181108-DS02
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5830538	N/A	2018/11/10	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5827280	N/A	2018/11/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	5830597	N/A	2018/11/12	Deonarine Ramnarine
Conductivity	AT	5830552	N/A	2018/11/10	Neil Dassanayake
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5830640	N/A	2018/11/12	Nimarta Singh
Hardness (calculated as CaCO3)		5827179	N/A	2018/11/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5828185	N/A	2018/11/12	Thao Nguyen
Ion Balance (% Difference)	CALC	5827180	N/A	2018/11/13	Automated Statchk
Anion and Cation Sum	CALC	5827281	N/A	2018/11/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5831662	N/A	2018/11/12	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5830573	N/A	2018/11/13	Chandra Nandlal
pH	AT	5830556	N/A	2018/11/10	Neil Dassanayake
Orthophosphate	KONE	5830606	N/A	2018/11/12	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5827282	N/A	2018/11/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5827283	N/A	2018/11/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5830605	N/A	2018/11/12	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5827284	N/A	2018/11/13	Automated Statchk
Total Suspended Solids	BAL	5830227	2018/11/09	2018/11/12	Nilam Borole

TEST SUMMARY

Maxxam ID: IGE070
Sample ID: WG-161413684-20181108-DS03
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5830538	N/A	2018/11/10	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5827280	N/A	2018/11/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	5830597	N/A	2018/11/12	Deonarine Ramnarine
Conductivity	AT	5830552	N/A	2018/11/10	Neil Dassanayake
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5830640	N/A	2018/11/12	Nimarta Singh
Hardness (calculated as CaCO3)		5827179	N/A	2018/11/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5828185	N/A	2018/11/12	Thao Nguyen
Ion Balance (% Difference)	CALC	5827180	N/A	2018/11/13	Automated Statchk
Anion and Cation Sum	CALC	5827281	N/A	2018/11/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5831662	N/A	2018/11/12	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5830573	N/A	2018/11/13	Chandra Nandlal
pH	AT	5830556	N/A	2018/11/10	Neil Dassanayake
Orthophosphate	KONE	5830606	N/A	2018/11/12	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5827282	N/A	2018/11/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5827283	N/A	2018/11/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5830605	N/A	2018/11/12	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5827284	N/A	2018/11/13	Automated Statchk
Total Suspended Solids	BAL	5830227	2018/11/09	2018/11/12	Nilam Borole

Maxxam ID: IGE071
Sample ID: WG-161413684-20181108-DS04
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5830538	N/A	2018/11/10	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5827280	N/A	2018/11/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	5830597	N/A	2018/11/12	Deonarine Ramnarine
Conductivity	AT	5830552	N/A	2018/11/10	Neil Dassanayake
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5830640	N/A	2018/11/12	Nimarta Singh
Hardness (calculated as CaCO3)		5827179	N/A	2018/11/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5828185	N/A	2018/11/12	Thao Nguyen
Ion Balance (% Difference)	CALC	5827180	N/A	2018/11/13	Automated Statchk
Anion and Cation Sum	CALC	5827281	N/A	2018/11/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5831662	N/A	2018/11/12	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5830573	N/A	2018/11/13	Chandra Nandlal
pH	AT	5830556	N/A	2018/11/10	Neil Dassanayake
Orthophosphate	KONE	5830606	N/A	2018/11/12	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5827282	N/A	2018/11/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5827283	N/A	2018/11/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5830605	N/A	2018/11/12	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5827284	N/A	2018/11/13	Automated Statchk
Total Suspended Solids	BAL	5830227	2018/11/09	2018/11/12	Nilam Borole

TEST SUMMARY

Maxxam ID: IGE072
Sample ID: WG-161413684-20181108-DS05
Matrix: Water

Collected: 2018/11/08
Shipped:
Received: 2018/11/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5830538	N/A	2018/11/10	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5827280	N/A	2018/11/12	Automated Statchk
Chloride by Automated Colourimetry	KONE	5830597	N/A	2018/11/12	Deonarine Ramnarine
Conductivity	AT	5830552	N/A	2018/11/10	Neil Dassanayake
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5830640	N/A	2018/11/12	Nimarta Singh
Hardness (calculated as CaCO3)		5827179	N/A	2018/11/13	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	5828185	N/A	2018/11/12	Thao Nguyen
Ion Balance (% Difference)	CALC	5827180	N/A	2018/11/13	Automated Statchk
Anion and Cation Sum	CALC	5827281	N/A	2018/11/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5831661	N/A	2018/11/13	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5830573	N/A	2018/11/13	Chandra Nandlal
pH	AT	5830556	N/A	2018/11/10	Neil Dassanayake
Orthophosphate	KONE	5830606	N/A	2018/11/12	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5827282	N/A	2018/11/13	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5827283	N/A	2018/11/13	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5830605	N/A	2018/11/12	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5827284	N/A	2018/11/13	Automated Statchk
Total Suspended Solids	BAL	5830227	2018/11/09	2018/11/12	Nilam Borole

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.0°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5828185	Dissolved Aluminum (Al)	2018/11/12	97	80 - 120	98	80 - 120	<0.0050	mg/L				
5828185	Dissolved Antimony (Sb)	2018/11/12	110	80 - 120	101	80 - 120	<0.00050	mg/L	2.4	20		
5828185	Dissolved Arsenic (As)	2018/11/12	103	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5828185	Dissolved Barium (Ba)	2018/11/12	100	80 - 120	99	80 - 120	<0.0020	mg/L	1.3	20		
5828185	Dissolved Beryllium (Be)	2018/11/12	103	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
5828185	Dissolved Bismuth (Bi)	2018/11/12	92	80 - 120	92	80 - 120	<0.0010	mg/L				
5828185	Dissolved Boron (B)	2018/11/12	99	80 - 120	100	80 - 120	<0.010	mg/L	2.5	20		
5828185	Dissolved Cadmium (Cd)	2018/11/12	103	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20		
5828185	Dissolved Calcium (Ca)	2018/11/12	NC	80 - 120	98	80 - 120	<0.20	mg/L				
5828185	Dissolved Chromium (Cr)	2018/11/12	100	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20		
5828185	Dissolved Cobalt (Co)	2018/11/12	100	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
5828185	Dissolved Copper (Cu)	2018/11/12	103	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5828185	Dissolved Iron (Fe)	2018/11/12	103	80 - 120	101	80 - 120	<0.10	mg/L				
5828185	Dissolved Lead (Pb)	2018/11/12	94	80 - 120	94	80 - 120	<0.00050	mg/L	NC	20		
5828185	Dissolved Magnesium (Mg)	2018/11/12	NC	80 - 120	98	80 - 120	<0.050	mg/L				
5828185	Dissolved Manganese (Mn)	2018/11/12	101	80 - 120	98	80 - 120	<0.0020	mg/L				
5828185	Dissolved Molybdenum (Mo)	2018/11/12	106	80 - 120	101	80 - 120	<0.00050	mg/L	4.7	20		
5828185	Dissolved Nickel (Ni)	2018/11/12	101	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5828185	Dissolved Phosphorus (P)	2018/11/12	109	80 - 120	109	80 - 120	<0.10	mg/L				
5828185	Dissolved Potassium (K)	2018/11/12	102	80 - 120	99	80 - 120	<0.20	mg/L				
5828185	Dissolved Selenium (Se)	2018/11/12	103	80 - 120	105	80 - 120	<0.0020	mg/L	NC	20		
5828185	Dissolved Silicon (Si)	2018/11/12	96	80 - 120	97	80 - 120	<0.050	mg/L				
5828185	Dissolved Silver (Ag)	2018/11/12	98	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20		
5828185	Dissolved Sodium (Na)	2018/11/12	NC	80 - 120	97	80 - 120	<0.10	mg/L	0.78	20		
5828185	Dissolved Strontium (Sr)	2018/11/12	NC	80 - 120	99	80 - 120	<0.0010	mg/L				
5828185	Dissolved Thallium (Tl)	2018/11/12	93	80 - 120	93	80 - 120	<0.000050	mg/L	NC	20		
5828185	Dissolved Tin (Sn)	2018/11/12	103	80 - 120	99	80 - 120	<0.0010	mg/L				
5828185	Dissolved Titanium (Ti)	2018/11/12	98	80 - 120	101	80 - 120	<0.0050	mg/L				
5828185	Dissolved Uranium (U)	2018/11/12	105	80 - 120	102	80 - 120	<0.00010	mg/L	1.2	20		
5828185	Dissolved Vanadium (V)	2018/11/12	102	80 - 120	98	80 - 120	<0.00050	mg/L	9.2	20		
5828185	Dissolved Zinc (Zn)	2018/11/12	99	80 - 120	99	80 - 120	<0.0050	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5829310	Total Carbonaceous BOD	2018/11/14					<2	mg/L	9.6	30	96	85 - 115
5830227	Total Suspended Solids	2018/11/12					<10	mg/L	NC	25	96	85 - 115
5830538	Alkalinity (Total as CaCO3)	2018/11/09			94	85 - 115	<1.0	mg/L	1.2	20		
5830552	Conductivity	2018/11/09			100	85 - 115	<1.0	umho/cm	0.43	25		
5830556	pH	2018/11/09			101	98 - 103			1.5	N/A		
5830573	Nitrate (N)	2018/11/13	90	80 - 120	98	80 - 120	<0.10	mg/L	0.38	20		
5830573	Nitrite (N)	2018/11/13	103	80 - 120	103	80 - 120	<0.010	mg/L	NC	20		
5830597	Dissolved Chloride (Cl-)	2018/11/12	115	80 - 120	104	80 - 120	<1.0	mg/L	1.3	20		
5830605	Dissolved Sulphate (SO4)	2018/11/12	NC	75 - 125	105	80 - 120	<1.0	mg/L	0.99	20		
5830606	Orthophosphate (P)	2018/11/12	113	75 - 125	100	80 - 120	<0.010	mg/L	NC	25		
5830640	Dissolved Organic Carbon	2018/11/12	95	80 - 120	98	80 - 120	<0.50	mg/L	0.55	20		
5831425	Dissolved Chloride (Cl-)	2018/11/12	110	80 - 120	103	80 - 120	<1.0	mg/L	0.67	20		
5831429	Dissolved Sulphate (SO4)	2018/11/12	NC	75 - 125	106	80 - 120	<1.0	mg/L	0.10	20		
5831501	Fluoride (F-)	2018/11/12	95	80 - 120	107	80 - 120	<0.10	mg/L	0	20		
5831504	pH	2018/11/12			102	98 - 103			2.1	N/A		
5831642	Total Kjeldahl Nitrogen (TKN)	2018/11/12	NC	80 - 120	102	80 - 120	<0.10	mg/L	0.78	20	99	N/A
5831661	Total Ammonia-N	2018/11/13	103	75 - 125	101	80 - 120	<0.050	mg/L	3.8	20		
5831662	Total Ammonia-N	2018/11/12	97	75 - 125	100	80 - 120	<0.050	mg/L	NC	20		
5831797	Total Aluminum (Al)	2018/11/12	101	80 - 120	101	80 - 120	<0.0050	mg/L	1.1	20		
5831797	Total Antimony (Sb)	2018/11/12	104	80 - 120	101	80 - 120	<0.00050	mg/L				
5831797	Total Arsenic (As)	2018/11/12	102	80 - 120	101	80 - 120	<0.0010	mg/L				
5831797	Total Bismuth (Bi)	2018/11/12	102	80 - 120	101	80 - 120	<0.0010	mg/L				
5831797	Total Cadmium (Cd)	2018/11/12	104	80 - 120	101	80 - 120	<0.00010	mg/L	NC	20		
5831797	Total Chromium (Cr)	2018/11/12	95	80 - 120	94	80 - 120	<0.0050	mg/L	NC	20		
5831797	Total Cobalt (Co)	2018/11/12	102	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
5831797	Total Copper (Cu)	2018/11/12	103	80 - 120	102	80 - 120	<0.0010	mg/L	10	20		
5831797	Total Iron (Fe)	2018/11/12	99	80 - 120	99	80 - 120	<0.10	mg/L	0.34	20		
5831797	Total Lead (Pb)	2018/11/12	101	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
5831797	Total Manganese (Mn)	2018/11/12	96	80 - 120	97	80 - 120	<0.0020	mg/L	2.3	20		
5831797	Total Molybdenum (Mo)	2018/11/12	103	80 - 120	97	80 - 120	<0.00050	mg/L	1.3	20		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**	**% Recovery**	**QC Limits**
5831797	Total Nickel (Ni)	2018/11/12	99	80 - 120	99	80 - 120	<0.0010	mg/L	0.39	20		
5831797	Total Phosphorus (P)	2018/11/12	102	80 - 120	106	80 - 120	<0.10	mg/L				
5831797	Total Selenium (Se)	2018/11/12	109	80 - 120	109	80 - 120	<0.0020	mg/L				
5831797	Total Silver (Ag)	2018/11/12	100	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20		
5831797	Total Tin (Sn)	2018/11/12	104	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20		
5831797	Total Titanium (Ti)	2018/11/12	99	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20		
5831797	Total Vanadium (V)	2018/11/12	97	80 - 120	96	80 - 120	<0.00050	mg/L	13	20		
5831797	Total Zinc (Zn)	2018/11/12	100	80 - 120	101	80 - 120	<0.0050	mg/L	3.2	20		
5832393	Phenols-4AAP	2018/11/13	101	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
5832812	Total Cyanide (CN)	2018/11/13	103	80 - 120	100	80 - 120	<0.0050	mg/L	NC	20		
5833748	Total Oil & Grease	2018/11/13			99	85 - 115	<0.50	mg/L	3.9	25		
5833755	Total Oil & Grease Mineral/Synthetic	2018/11/13			96	85 - 115	<0.50	mg/L	2.7	25		
5836000	Mercury (Hg)	2018/11/14	99	75 - 125	105	80 - 120	<0.0001	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

Sirimathie Aluthwala, Campobello Micro

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

MICRO

Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817 5777 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:

Company Name: #9197 Stantec Consulting Ltd
Attention: Accounts Payable
Address: 300 Hagey Blvd Suite 100
Waterloo ON N2L 0A4
Tel: (519) 579-4410 Fax: (519) 579-6733
Email: SAPinvoices@Stantec.com

REPORT TO:

Company Name:
Attention: Grant Whitehead
Address:
Tel: (519) 585-7400 Fax: (519) 579-4239
Email: grant.whitehead@stantec.com

PROJECT INFORMATION:

Quotation #: B77373
P.O. #: 400
Project: 161413684
Project Name:
Site #:
Sampled By: Drew Smith

Laboratory Use Only:

Maxxam Job #:
Bottle Order #: 586036
COC #: C#586036-01-01
Project Manager: Augustyna Dobosz

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ______
☒ PWQO
☒ Other ODWS

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ______

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle) [✓ Metals] / Hg / Cr VI	RCAp - Comprehensive	Total Suspended Solids	The City of Guelph Sanitary and Storm Sewer Bylaw	Total metals (not filtered)							# of Bottles	Comments
1		WG-161413684-20181108-DP01	2018/11/08	11:30	GW	X			X	X							11	Total metals and dissolved metals
2		WG-161413684-20181108-DS02	2018/11/08	12:40	GW	X	X	X									5	
3		WG-161413684-20181108-DS03	↓	13:15	GW	X	X	X									5	
4		WG-161413684-20181108-DS04		13:20	GW	X	X	X									5	
5		WG-161413684-20181108-DS05		13:45	GW	X	X	X									5	
6																		
7																		
8																		
9																		
10																		

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required ______ Time Required ______ ☐
Rush Confirmation Number ______ (call lab for #)

08-Nov-18 14:50
Augustyna Dobosz
B8T9171
CA2 ENV-961

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
/ Drew Smith	18/11/08	15:00		2018/11/08	16:50	
				2018/11/08	17:59	

Laboratory Use Only

Time Sensitive:
Temperature (°C) on Recei: 0 0 0

Custody Seal	Yes	No
Present		✓
Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF

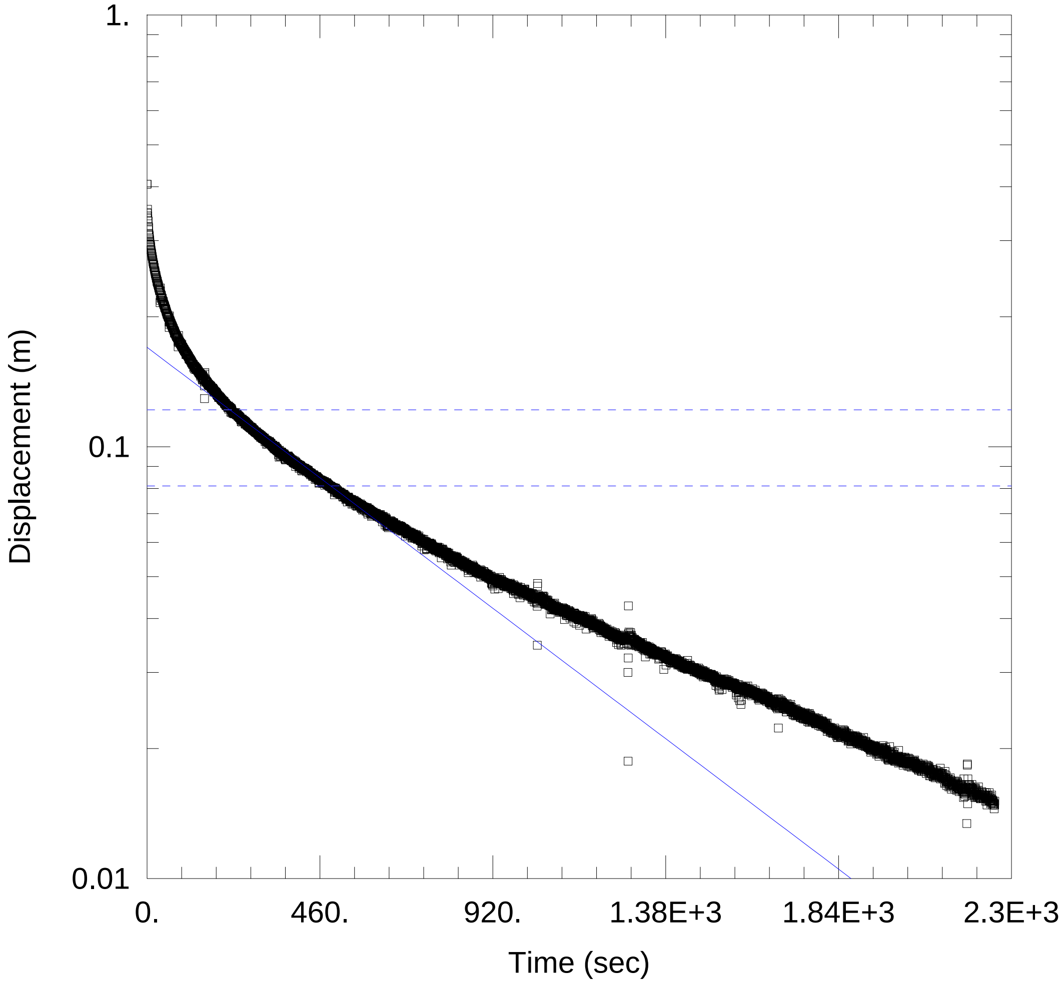
SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

37021 6/3/4 ice ice

Maxxam Analytics International Corporation o/a Maxxam Analytics

APPENDIX G:
HYDRAULIC CONDUCTIVITY SOLUTIONS



MW2-18

Data Set: \...\161413684_MW2-18_20180803_DS_JK.aqt
Date: 11/21/18 Time: 15:25:14

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Guelph, Ontario
Test Well: MW2-18
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 2.44 m
Anisotropy Ratio (Kz/Kr): 0.5

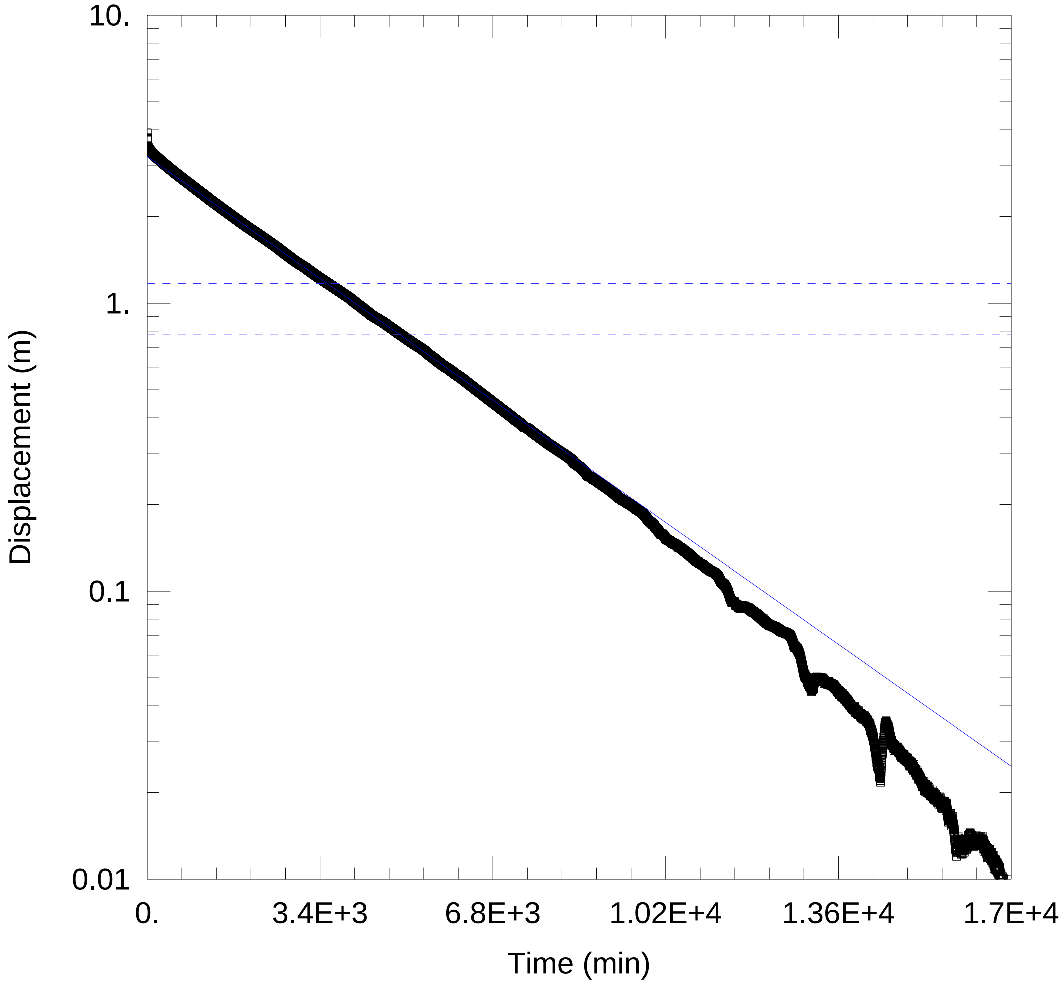
WELL DATA (MW2-18)

Initial Displacement: 0.4056 m
Static Water Column Height: 7.29 m
Total Well Penetration Depth: 2.44 m
Screen Length: 2.44 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 4.7E-7 m/sec
y0 = 0.1699 m



MW3-18

Data Set: \...\161413684_MW3-18_DS_JK.aqt
Date: 11/21/18 Time: 16:06:39

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Kitchener, ON
Test Well: MW3-18
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 6.91 m
Anisotropy Ratio (Kz/Kr): 0.3

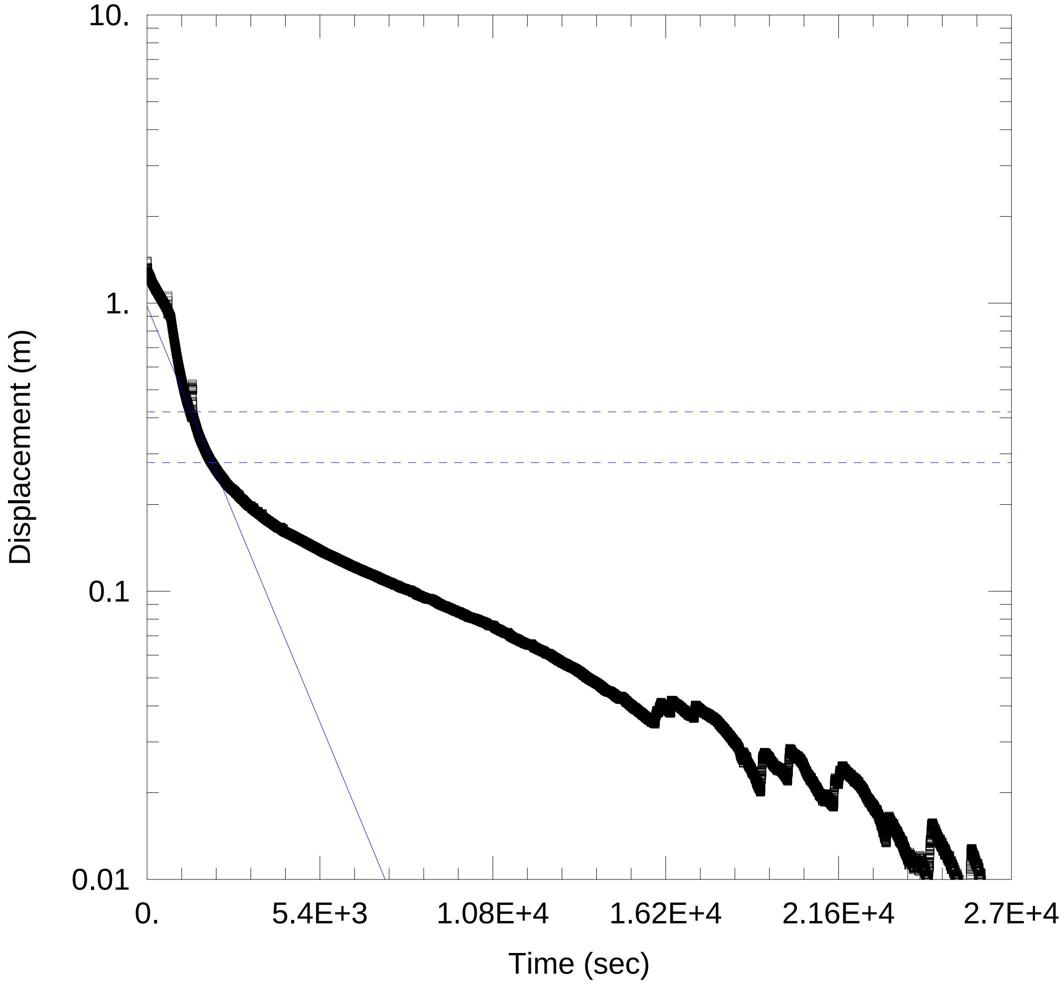
WELL DATA (MW3-18)

Initial Displacement: 3.902 m
Static Water Column Height: 6.375 m
Total Well Penetration Depth: 6.325 m
Screen Length: 3.05 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.6E-9 m/sec
y0 = 3.231 m



MW4-18S

Data Set: \...\161413684_MW4-18S_DS_JK.aqt
Date: 11/22/18 Time: 10:00:42

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Kitchener, ON
Test Well: MW4-18S
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 10.41 m Anisotropy Ratio (Kz/Kr): 0.3

WELL DATA (MW4-18S)

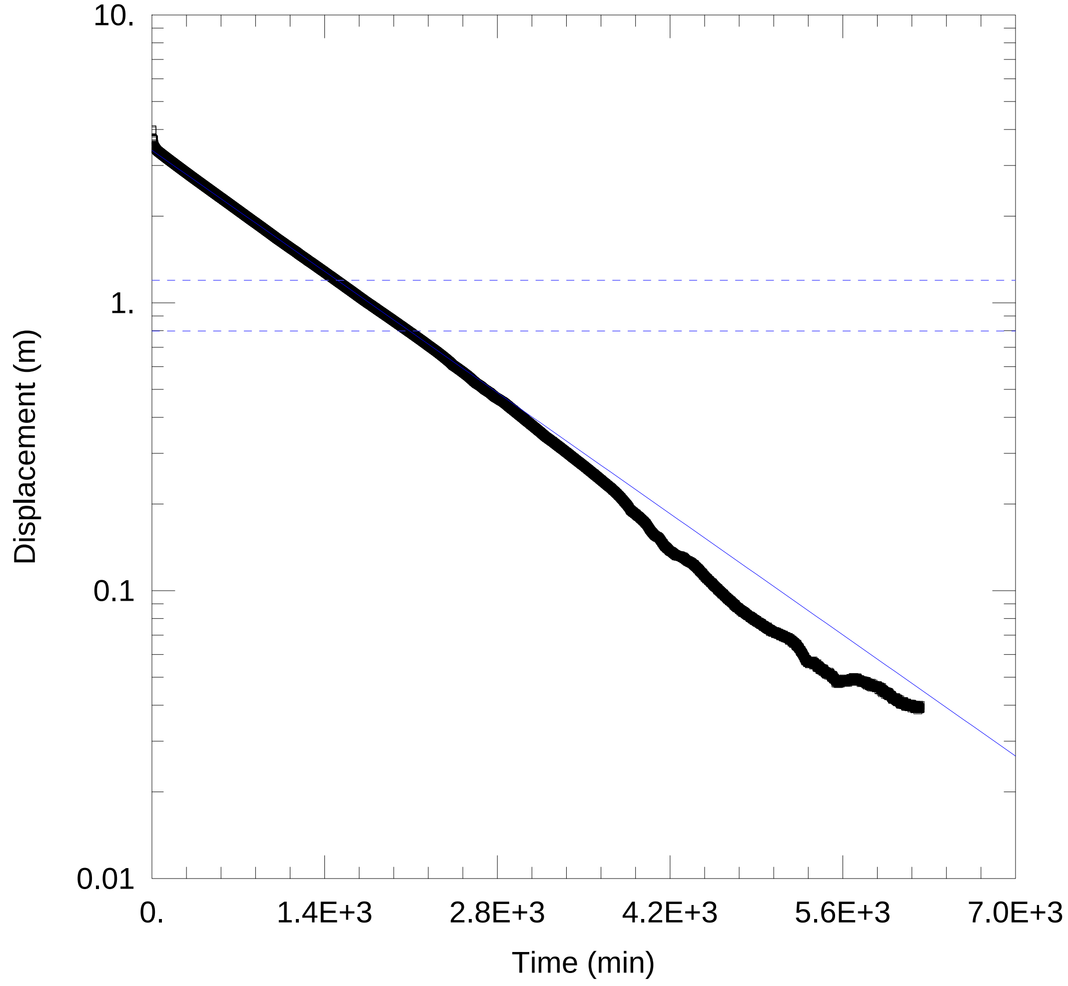
Initial Displacement: 1.398 m
Total Well Penetration Depth: 4.155 m
Casing Radius: 0.0254 m

Static Water Column Height: 4.105 m
Screen Length: 3.05 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.8E-7 m/sec y0 = 0.9741 m



MW4-18D

Data Set: \...\161413684_MW4-18D_confined_DS_JK.aqt
Date: 11/22/18 Time: 09:54:50

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Kitchener, ON
Test Well: MW4-18D
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 3.63 m
Anisotropy Ratio (Kz/Kr): 0.3

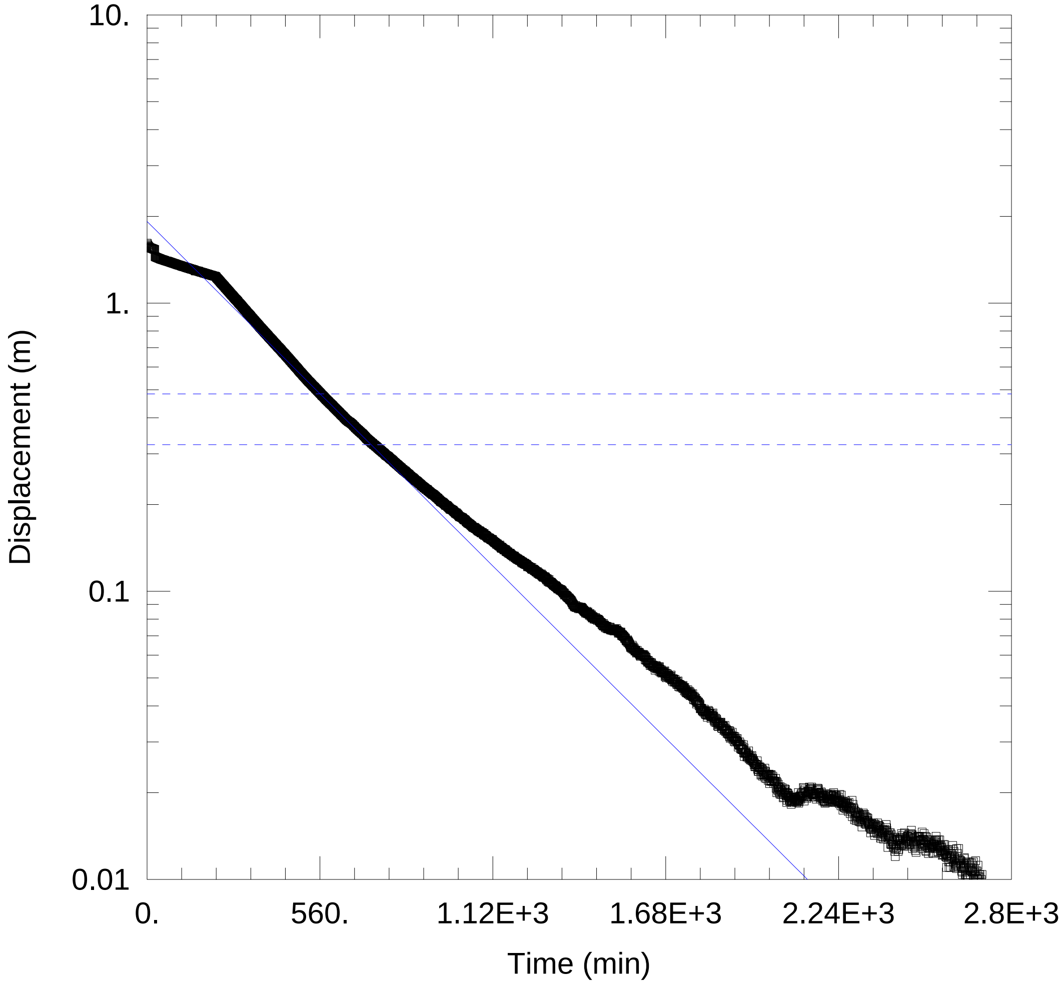
WELL DATA (MW4-18D)

Initial Displacement: 3.99 m
Static Water Column Height: 8.185 m
Total Well Penetration Depth: 3.05 m
Screen Length: 3.05 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 3.4E-9 m/sec
y0 = 3.387 m



MW5-18S

Data Set: \...\161413684_MW5-18S_DS_JK.aqt
Date: 11/21/18 Time: 16:35:11

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Guelph, ON
Test Well: MW5-18S
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 12.16 m Anisotropy Ratio (Kz/Kr): 0.3

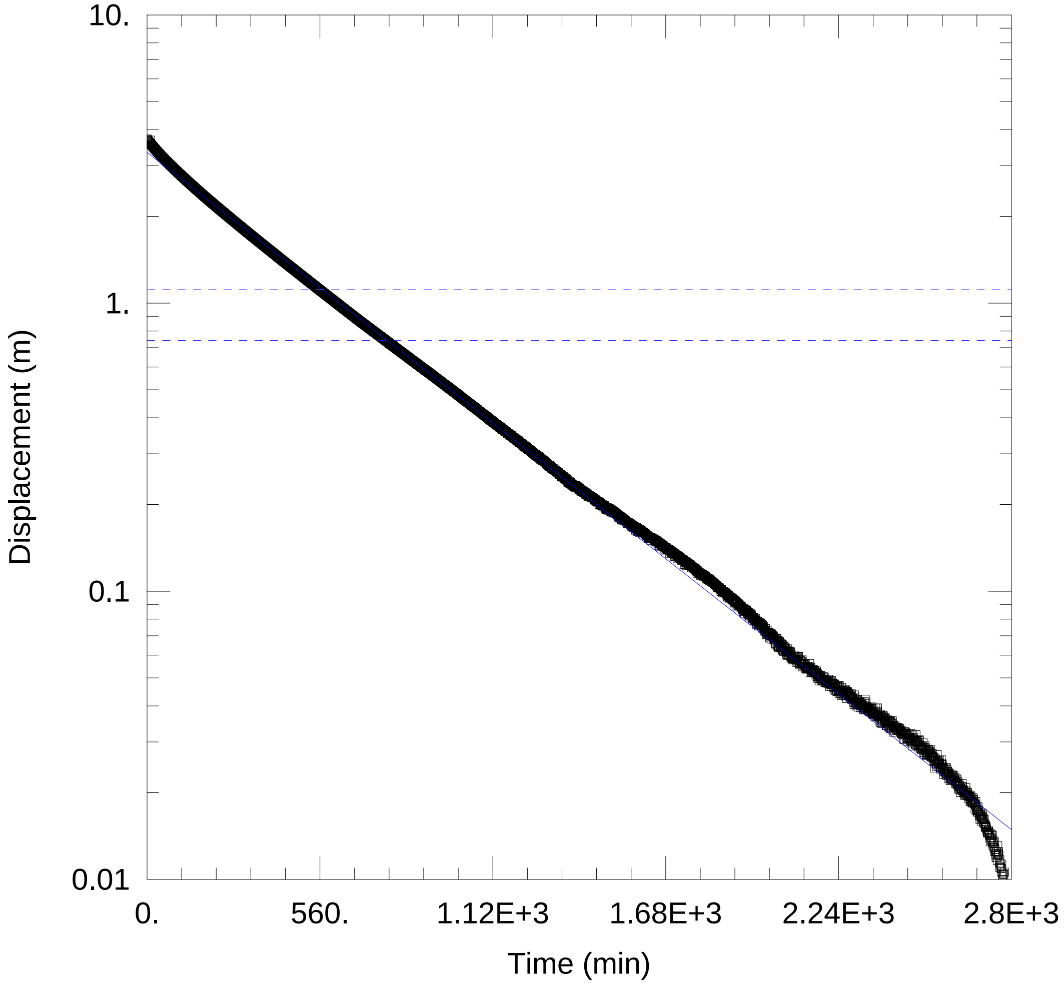
WELL DATA (MW5-18S)

Initial Displacement: 1.613 m Static Water Column Height: 4.35 m
Total Well Penetration Depth: 4.35 m Screen Length: 3.05 m
Casing Radius: 0.0254 m Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.2E-8 m/sec y0 = 1.92 m



MW5-18D

Data Set: \...\161413684_MW5-18D_DS_JK.aqt
Date: 11/21/18 Time: 16:34:37

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Kitchener, ON
Test Well: MW5-18D
Test Date: 2018/07/27

AQUIFER DATA

Saturated Thickness: 9.015 m
Anisotropy Ratio (Kz/Kr): 0.3

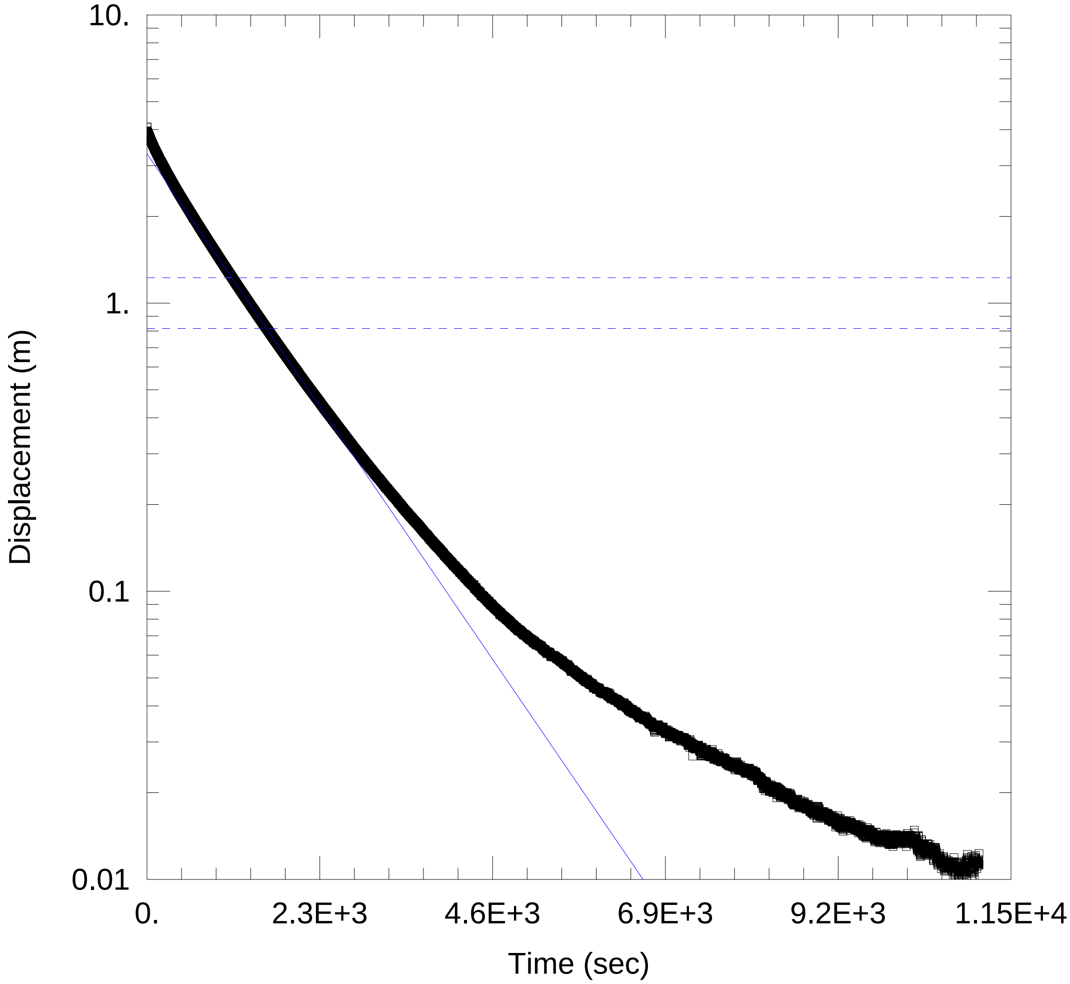
WELL DATA (MW5-18D)

Initial Displacement: 3.711 m
Static Water Column Height: 8.455 m
Total Well Penetration Depth: 8.459 m
Screen Length: 1.524 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.0E-8 m/sec
y0 = 3.333 m



MW6-18

Data Set: \...\161413684_MW6-18_20180807_DS_JK.aqt
Date: 11/21/18 Time: 16:37:22

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Guelph, Ontario
Test Well: MW6-18
Test Date: 2018/07/26

AQUIFER DATA

Saturated Thickness: 8.545 m
Anisotropy Ratio (Kz/Kr): 0.3

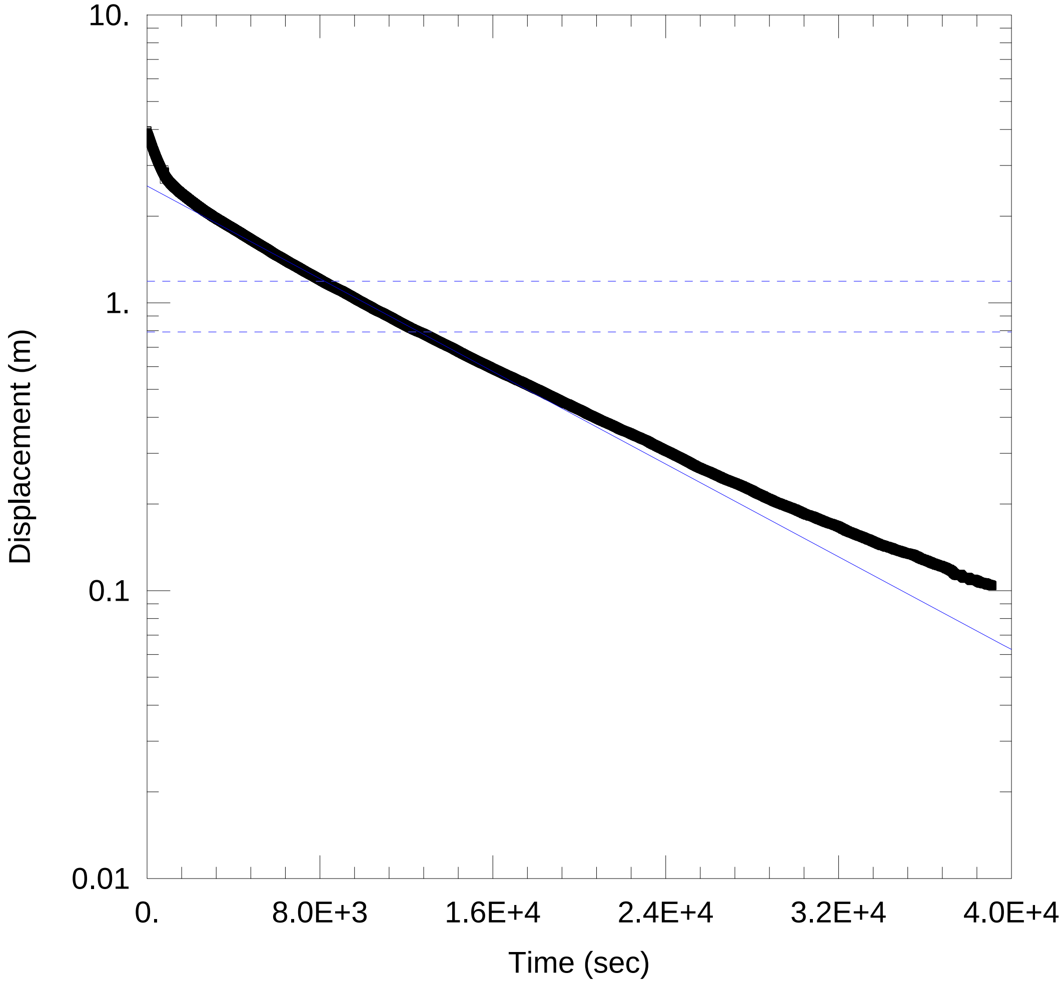
WELL DATA (MW6-18)

Initial Displacement: 4.08 m
Static Water Column Height: 7.94 m
Total Well Penetration Depth: 7.964 m
Screen Length: 1.524 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.4E-7 m/sec
y0 = 3.297 m



MW7-18

Data Set: \...\161413684_MW7-18_20180803_DS_JK.aqt
Date: 11/21/18 Time: 16:42:06

PROJECT INFORMATION

Company: Stantec
Project: 161413684
Location: Guelph, Ontario
Test Well: MW7-18
Test Date: 2018/07/26

AQUIFER DATA

Saturated Thickness: 8.64 m
Anisotropy Ratio (Kz/Kr): 0.3

WELL DATA (MW7-18)

Initial Displacement: 3.961 m
Static Water Column Height: 8.195 m
Total Well Penetration Depth: 8.219 m
Screen Length: 1.524 m
Casing Radius: 0.0254 m
Well Radius: 0.105 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.8E-8 m/sec
y0 = 2.545 m

APPENDIX H:
DEWATERING CALCULATIONS

Table H1 - Groundwater Dewatering Calculations

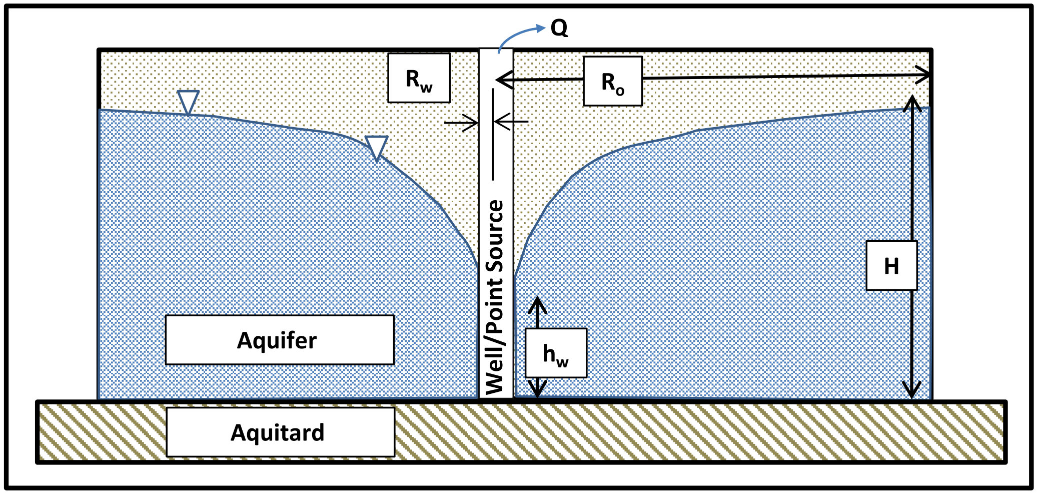
Dupuit Forcheimer Equation for Radial Flow to a Well or Point Source Excavation in an Unconfined Aquifer:

$$Q = \frac{\pi K\left(H^2 - {h_w}^2\right)}{ln\frac{R_o}{r_w}}$$

Where:

Q = pumping rate (m^3/s)
K = hydraulic conductivity (m/s)
H = hydraulic head of the original water table (m)
h_w = hydraulic head at maximum dewatering (m)
R_o = radius of influence from centre of the excavation caused by pumping (m)
r_w = equivalent radius of dewatering area / theoretical radius of pumping well (m)

Conceptual Drawdown



The equivalent radius of influence (R_o) is approximated using the Sichart and Kryieleis method:

$$R_o = r_w + 3000(H - h_w)\sqrt{K}$$

The term r_w is calculated as follows:

$$r_w = \sqrt{\frac{area}{\pi}}$$

Where: area = area of excavation (m^2)

Calculations:

K = 3.7E-08 m/s
H = 20.3 m
h_w = 14.7 m
R_o = 63.6 m
r_w = 60.4 m

Q= 0.00043649 m^3/s
37,713 L/day

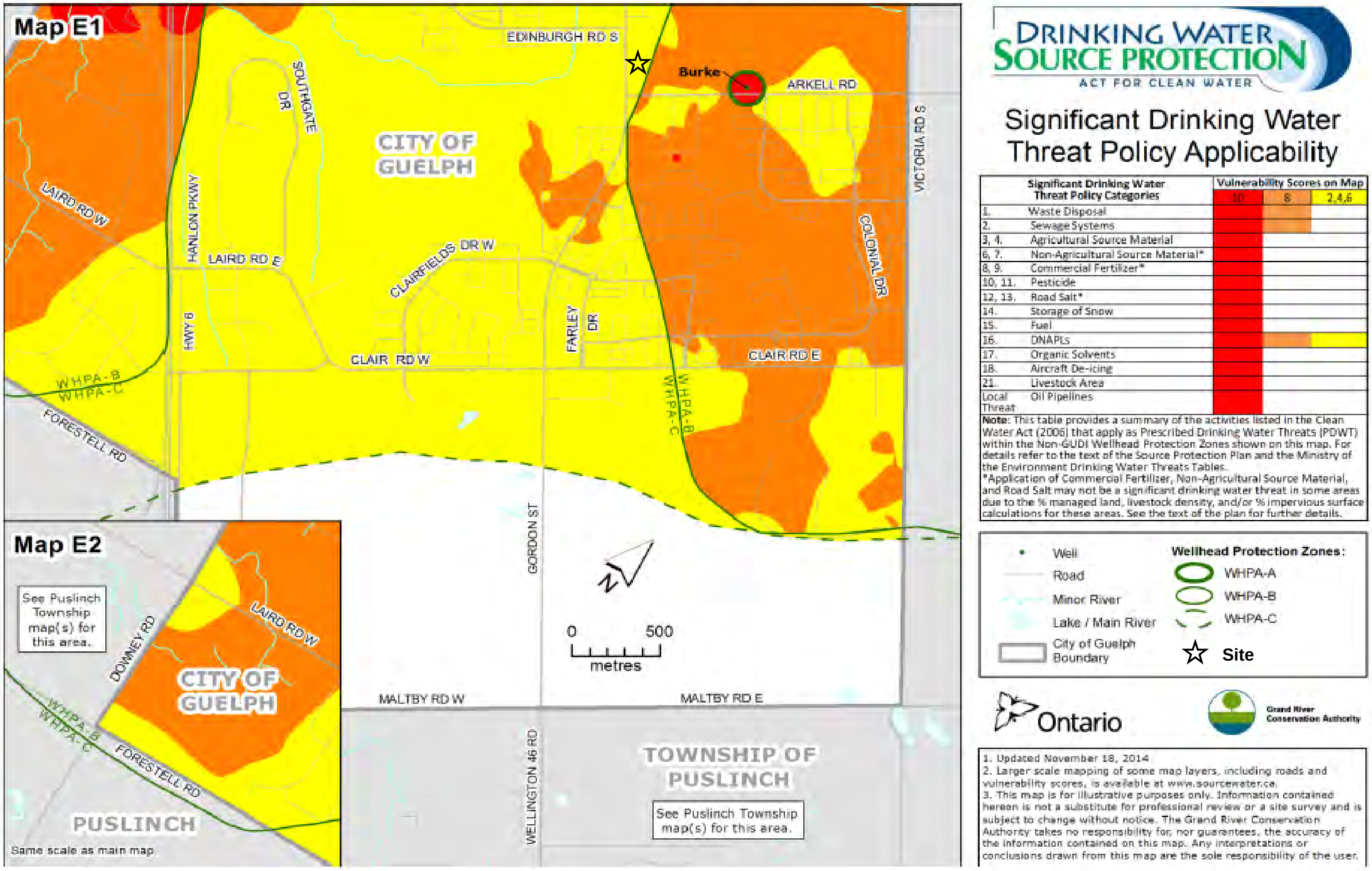
Dewatering radius of influence beyond edge of dewatering area = 3.2 m

Base of Aquifer	320	m AMSL		approximate elevation at which bedrock is encountered beneath the Site
Static Water Level	340.3	m AMSL		highest groundwater elevation measured in onsite monitoring wells
Elevation requiring dewatering	334.7	m AMSL	5.6	meters of groundwater height to be lowered (base elevation of Parking Level 2)

Equations obtained from Powers, J.P., A.B. Corwin, P.C. Schmall, and W.E. Kaeck, 2007. Construction Dewatering and Groundwater Control, New Methods and Applications. John Wiley & Sons, Inc., 3rd Edition.

APPENDIX I:
SSP THREAT POLICY APPLICABILITY MAPPING

8.12 Schedule F: City of Guelph: Guelph Waterworks Well Supply, Map E



Significant Drinking Water Threat Policy Applicability

Significant Drinking Water Threat Policy Categories		Vulnerability Scores on Map		
		10	8	2,4,6
1.	Waste Disposal	🟥	🟧	
2.	Sewage Systems	🟥	🟧	
3, 4.	Agricultural Source Material	🟥		
6, 7.	Non-Agricultural Source Material*	🟥		
8, 9.	Commercial Fertilizer*	🟥		
10, 11.	Pesticide	🟥		
12, 13.	Road Salt*	🟥		
14.	Storage of Snow	🟥		
15.	Fuel	🟥		
16.	DNAPLs	🟥	🟧	🟨
17.	Organic Solvents	🟥		
18.	Aircraft De-icing	🟥		
21.	Livestock Area	🟥		
Local Threat	Oil Pipelines	🟥		

Note: This table provides a summary of the activities listed in the Clean Water Act (2006) that apply as Prescribed Drinking Water Threats (PDWT) within the Non-GUDI Wellhead Protection Zones shown on this map. For details refer to the text of the Source Protection Plan and the Ministry of the Environment Drinking Water Threats Tables.

*Application of Commercial Fertilizer, Non-Agricultural Source Material, and Road Salt may not be a significant drinking water threat in some areas due to the % managed land, livestock density, and/or % impervious surface calculations for these areas. See the text of the plan for further details.

1. Updated November 18, 2014
2. Larger scale mapping of some map layers, including roads and vulnerability scores, is available at www.sourcewater.ca.
3. This map is for illustrative purposes only. Information contained hereon is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.

Source: Lake Erie Region Source Protection Committee. 2015b. Grand River Source Protection Area, Approved Source Protection Plan – Volume II. November 26, 2015.

APPENDIX J:
CORRESPONDENCE WITH CITY OF GUELPH

17 October 2018

Sent via email

Melissa Straus, MSc.
Terrestrial Ecologist
Stantec
1-70 Southgate Drive
Guelph ON
N1G 4P5

Dear Melissa,

RE: 1242, 1250 and 1260 Gordon Street and 9 Valley Road EIS TOR

City of Guelph Environmental Planning and Park Planning staff reviewed the proposed Environmental Impact Study (EIS) Terms of Reference (TOR) prepared by Stantec, dated July 19, 2018. Park Planning staff provided comments to Environmental Planning Staff on September 7, 2018. The Grand River Conservation Authority (GRCA) also provided comments on the EIS TOR on October 17, 2018 via email. All comments received to date are integrated below and appended to this letter.

On September 12, 2018 the EIS TOR was brought forward to the Environmental Advisory Committee (EAC) and the TOR was accepted with conditions.

Subwatershed Context:

1. The EIS TOR should indicate that the lands fall partially within the Hanlon Creek Subwatershed and partially within the Torrance Creek Subwatershed. As part of the background review, the Torrance Creek Subwatershed Study and Hanlon Creek Subwatershed Study should be referred to. These subwatershed studies include targets and recommendations that should also be considered in the EIS.
2. The hydrology of the adjacent Provincially Significant Wetland (PSW) should be characterized and an associated water balance for the natural feature should be prepared as part of a Hydrogeological Report to support the EIS, in addition to the water budget that forms part of the Stormwater Management Report. This should include consideration for any groundwater impacts from underground parking, where proposed. Incorporation of Low Impact Development (LID) as part of the stormwater management (SWM) approach is also encouraged to assist with achieving a water balance for the site, and maintaining infiltration and recharge functions.

Hydrological / Hydrogeological Study to support EIS

3. It is not clear where or what type of instrumentation will be used to characterize existing conditions and assess the wetland water balance. In terms of data collection, staff would like to see continuous data loggers installed in piezometers. Also, ensure wetland catchments are delineated and depicted to set the context and that the analysis is provided on a

monthly as well as annual basis. Please interpret the data in terms of the pre-to-post wetland water balance.

4. The Hydrogeological Study should identify groundwater levels to inform the required separation distance for the development from the groundwater table.
5. Consideration should also be given to the protection of groundwater functions, including recharge. Also review and consider any other recommendations or requirements from the Torrance Creek Subwatershed Study within the EIS.
6. Results from the Hydrological Study should be integrated into the EIS to assess the potential for hydrologic impacts to the adjacent wetland.

Preliminary Screening Assessment for Significant Wildlife Habitat:

7. April 2017 guidance from the Ministry of Natural Resources and Forestry (MNRF) Guelph District on survey protocols for identifying suitable maternity roost trees indicate that surveys should be completed during leaf-on condition for Tri-colored Bat (*Perimyotis subflavus*) which roost in dead/dying leaves along a dead branch, and during leaf-off condition for Little Brown Myotis/Northern Myotis (*Myotis lucifugus*/*M. septentrionalis*) which roost in tree hollows and cracks. Field surveys are proposed in May to assess Bat Roost Habitat, and should also be proposed during leaf-off condition. Note that surveys in May should be completed in late May to ensure that leaves have in fact developed.
8. Note that where surveys for SWH are not proposed, staff expect a conservative approach to be taken in the EIS which acknowledges candidate SWH and identifies constraints based on the precautionary principle.
9. The EIS TOR indicates that candidate SWH is present for Reptile Hibernaculum. Clarification is needed as to what field surveys for wildlife habitat assessment entail. It is unclear whether or not snake exit surveys and/or snake surveys are proposed.
10. Candidate SWH is also identified for Woodland Raptor Nesting Habitat. Clarification is needed as to whether or woodland raptor nesting surveys are proposed as part of surveys for wildlife habitat.
11. Note that deer movement occurs along the edge of the PSW (as observed through other EISs) as well as across Gordon Street (as indicated in the Natural Heritage Strategy). Table 1 should be updated to reflect this information.

EIS Field Surveys:

12. Location of field surveys, such as breeding bird point count locations and amphibian monitoring stations should be provided on a study area map.
13. MNRF has identified the Torrance Creek PSW as a deer winter congregation area. The habitat should be characterized and impacts assessed through the EIS. In addition, staff request that movement of deer be studied on the subject lands using wildlife cameras to assess movement in the east-west and north-south direction.
14. Clarification on the timing (e.g. spring emergence, first/second breeding bird window), conditions and search effort proposed for wildlife surveys, species of special concern and rare species searches is necessary.
15. Vegetation community mapping should also indicate woodland staking with City staff as a requirement.

16. Spring botanical inventories should ideally be completed in early May. Waiting until June will miss early spring ephemerals, which will have senesced by June.
17. Vegetation community descriptions should include description of soils, per the Ecological Land Classification (ELC) protocol.
18. Table 1 indicates that incidental observations of terrestrial crayfish will be recorded. Clarify where searches for terrestrial crayfish will be performed (i.e. target habitats).
19. Regarding Species of Conservation Concern/Locally Rare Species, it should be noted that City records show that American Bullfrog (*Lithobates catesbeianus*) and Meadow Horsetail (*Equisetum pretense*) have been recently documented in the Torrance Creek Subwatershed.
20. Section 4.2.1.2 Vascular Plants should be revised to indicate that a three-season botanical inventory will be completed.
21. Note that formal wetland boundary and woodland boundary delineation with agencies is required.
22. With respect to area sensitive breeding bird habitat, based on results from multiple EISs completed in this area of the City, it has been confirmed that the Torrance Creek PSW is SWH for area-sensitive breeding bird habitat. The proposed studies should assess the use of habitat edges and areas in relation to the site in order to assess potential impacts.

Tree Inventory and Preservation Plan:

23. The subject lands are regulated under the City's Private Tree By-law and any tree removals will require authorization from the City. The EIS should inform the development application and should look for opportunities to retain trees and integrate them into the development proposal, where feasible. A Tree Inventory and Preservation Plan (TIPP), undertaken by a qualified arborist, is required and should be integrated into the EIS. The TIPP should include the following:
    - Tree inventory information for all trees 10cm Diameter at Breast Height (DBH) or greater proposed to be removed/retained including: Tree # corresponding to plan/drawing, species name, DBH, crown diameter, condition (vigour), remarks, recommended action and rationale.
    - Identify shared, public and private trees with crowns that are within 6m of property lines.
    - Identify opportunities for protection, enhancement and restoration of trees within the Urban Forest.
    - Tree Protection Fencing locations and/or other tree protection/mitigation measures.
24. The TIPP should also note that where preservation is not possible, as agreed to by the City, compensation is required. Note that the City seeks compensation at a 3:1 replacement ratio. Where replacement plantings are not achievable cash-in-lieu may be accepted at a rate of $500 for each damaged or destroyed tree.

EIS Data Analysis

25. The EIS TOR should indicate that where candidate or confirmed SWH exists, staff would like to see it mapped in the EIS.

26. The City of Guelph Local Species List should be consulted when doing the impact analysis and the species lists should include a column to indicate any locally significant species.
27. Deer movement patterns that occur on the subject lands should be mapped in the EIS, and all data collected from wildlife cameras and field studies should be provided.

Impact Analysis:

28. A buffer analysis should be included within the impacts assessment/avoidance discussion. While the City's OP does include policies for minimum buffers, the establishment of larger buffers warrants consideration in the EIS and is also reflected in the City's OP policies.
29. The proposed development concept needs to consider the trail connection across the site. The EIS should explore alternatives for a trail alignment and assess impacts associated with each alignment. Staff should be consulted for further direction on this item.
30. The setbacks and buffers assigned to the development should factor in the community trail that will be built, even though the trail will ultimately be completed by the City.
31. Opportunities for protection, enhancement and restoration of trees within the Urban Forest should also be identified.
32. The impact analysis should mention potential impacts and/or mitigation measures to address salt application.
33. It is acknowledged that the EIS will include a more defined concept of the proposed development plan in order to assess potential impacts resulting from grading, roads, SWM, etc.

Recommended Mitigation Measures:

34. The EIS should also recommend mitigation measures including environmental education and outreach opportunities, demarcation and any recommendations for monitoring plans.
35. The monitoring plan should include post-construction monitoring of SWM design, LID measures and mitigation.
36. An Environmental Implementation Report (EIR) will be required for this development. Environmental Planning staff have found it helpful to document considerations for the EIR in the EIS.

Park Planning Comments (see attached Memo):

37. Provide a revised development concept plan indicating all the proposed elements including public park, east-west and north-south public trail, Active Transportation Network (ATN) and open space in consultation with City staff.
38. Park planning staff would like to walk the site along with the environmental consultant and environmental planning staff to identify and approve a preliminary trail alignment. The approved trail alignment will be flagged on site. Identify the final trail alignment west of Torrance Creek PSW, through EIS and flag the trail route on site for City's review.
39. Trail design including surfacing, clear width and height, grading and drainage, trail signage, etc. should be provided in consultation with Park Planning staff. The design and development of the trail system should be completed in accordance with the city's Facility Accessibility Design

Manual, the city's current trail design and development practice and standards, and ATN standards.

40. Assess the environmental impact of the proposed trail development in the EIS.
41. Recommend measures to mitigate the environmental impact due to the proposed trail development in the EIS.
42. Recommend management of the woodland along the trail route including removal of invasive species and hazard trees in the EIS.
43. Recommend preparation of an EIR, Trail and Landscape Drawings through EIS to detail design an appropriate trail system and associated mitigation measures in accordance with the city's design and development standards.
44. Provide preliminary grading and drainage plans to demonstrate that the design of the park block, trail connection and open space meets city standards.
45. The owner will be responsible for implementation of city approved landscape plans in accordance with the EIR including, but not limited to restoration, compensation and enhancement planting within the open space.
46. Describe the recommended approach to demarcate existing and proposed public park and open spaces, if any, within and adjacent to the subject property.
47. Recommend provision of public education through educational/interpretive signage at the entry points to the trail and open space system. Public education should address the environmental sensitivity of natural heritage features and procedures residents can follow to protect and/or enhance these areas.
48. City will review and approve the design and locations of interpretive and educational signage, to be included on landscape plans.

Environmental Advisory Committee:
On September 12, 2018 the EIS TOR was brought forward to EAC and resulted in the following draft motion. Note that motions remain draft until such time that EAC formally adopts the minutes.

Staff recommends that the Environmental Advisory Committee accept the Terms of Reference for an Environmental Impact Study prepared by Stantec (July 19, 2018) with the following condition:
THAT a revised EIS TOR is provided which addresses staff comments and at a minimum includes:

- A study area map showing survey locations;
- A Tree Inventory and Preservation Plan;
- Clarification on surveys proposed for assessing significant wildlife habitat;
- Deer movement surveys using wildlife cameras;
- Commitment to utilize continuous data loggers to collect data to support a wetland water balance and a monthly analysis;
- Recommended mitigation measures for salt management; and
- Considerations for a future Environmental Implementation Report.
- A hydrogeological report that includes the following:
    - Infiltration testing using a Guelph Permeameter (or equivalent method) to support SWM planning;

- Hydrographs that include high water table data including the spring freshet and other storm and melt events. Groundwater data should be collected for a minimum of 1 year, with comparison to local precipitation data;
- It is also recommended that groundwater data be collected from the wetland area (pending access).

Do not hesitate to contact me further should you have any questions.

Regards,

Leah Lefler

Leah Lefler, MES
Environmental Planner

Planning, Urban Design and Building Services
Infrastructure, Development and Enterprise
City of Guelph: 1 Carden Street, Guelph

T 519-822-1260 x2362
F 519-822-4632
E leah.lefler@guelph.ca

cc Chris DeVriendt – Manager, Development Planning
Melissa Aldundate – Manager, Planning Policy and Urban Design
Mary Angelo – Supervisor, Development Engineering
Jyoti Pathak – Park Planner

INTERNAL MEMO

DATE September 7, 2018

TO **Leah Lefler**

FROM Jyoti Pathak
DIVISION Parks and Recreation
DEPARTMENT Public Services

SUBJECT **1242, 1250 and 1260 Gordon Street and 9 Valley Road – Proposed Terms of Reference for Environmental Impact Study –(File # TBD)**

Parks Planning and Development has reviewed the draft Terms of Reference (TOR) prepared by Stantec dated July 19, 2018 for an Environmental Impact Study (EIS) to be compiled in support of a draft plan of subdivision and Zoning By-Law and Official Plan Amendments for the proposed high density residential subdivision development on the subject property.

Location: The subject property is located on the east side of Gordon Street immediately south of Valley Road.

Development Proposal: The future development proposal will include a public street, public park, public trail/ ATN route, natural open space, residential apartments and townhouses. A pre-consultation meeting between the applicant and City staff was scheduled on Wednesday June 13, 2018 and a concept plan has been developed by the applicant. The site area is 3.67 hectares inclusive of natural heritage features and a developable area.

Background:

Parkland Dedication:

In accordance with the City's Official Plan Policy 7.3.5.1 (ii) parkland dedication is required for the proposed residential subdivision development. Park block frontage, size and configuration of the park will be determined in accordance with the neighbourhood park design criteria outlined in City's official Plan and Zoning By-Law. Park block would be located within developable area of the site and outside of the existing natural heritage system.

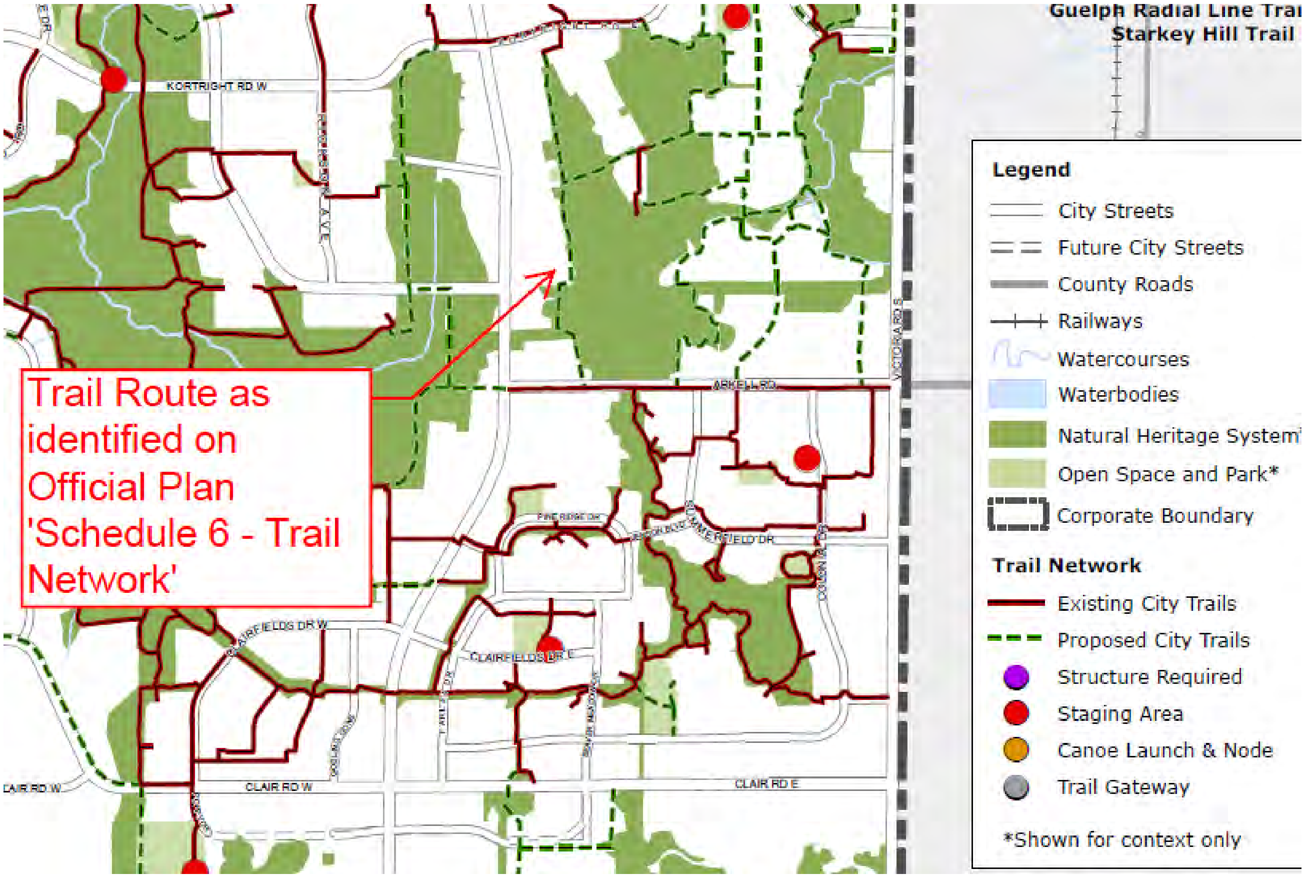
Guelph Trail Network:

Official Plan 'Schedule 6 - Trail Network' identifies a proposed north-south multi-use trail route from Brady Lane (south of Kortright Road East) to Arkell Road along the west side of Torrance Creek PSW Complex. The proposed multi-use trail would be used for walking, cycling, personal mobility devices etc.

Multi-Use Trail System / Active Transportation Route (AT Route) (north-south) from Arkell Road to Brady Lane west of the Torrance Creek provincially significant wetlands (PSW):

The trail system from Arkell Road to Brady Lane aligns with the active transportation route and serves both recreational and transportation purposes. This route is being detailed designed in segments through review of the past and current development applications. The trail route immediately north of the subject property was identified through site plan approval process of the existing Valley Road extension condominium and the trail property immediately south of the subject property has been secured through development approval process on 1280 and 1284 Gordon Street.

Multi-Use Trail / AT Route (east-west) from Gordon Street to the proposed Trail west of Torrance Creek PSW: Provide a direct, accessible, multi-use active transportation route from the Gordon Street to the proposed Multi Use Trail system.



Trail Route as identified on Official Plan 'Schedule 6 - Trail Network'

Active Transportation Route in yellow highlight

Parks Planning and Development offer the following comments:

1. **Development concept plan:**
    - Provide a revised development concept plan indicating all the proposed elements including public park, east-west and north-south public trail/ ATN route from Gordon Street to the and open space in consultation with City staff.

2. **Trail route alignment:**
    - Park planning staff would like to walk the site along with the environmental consultant and environmental planning staff to identify and approve preliminary trail alignment. The approved trail alignment will be flagged on site. Identify the final trail alignment west of Torrance Creek PSW, through EIS and flag the trail route on site for City’s review.

3. **Trail design and development standards:**
    - Trail design including surfacing, clear width and height, grading and drainage, trail signage etc. would be finalized in consultation with Park Planning staff. The design and development of the trail system would be completed in accordance with City’s Facility Accessibility Design Manual, City’s current trail design and development practice and standards and Active Transpiration standards.

4. **Environmental impacts and mitigation:**
    - Assess the environmental impact of the proposed trail development through EIS.
    - Recommend measures to mitigate the environmental impact due to the proposed trail development through the EIS.
    - Recommend management of the woodlot along the trail route including removal of invasive species and hazard trees through the EIS.
    - Recommend preparation of an Environmental Implementation Report (EIR), Trail and Landscape Drawings through EIS to detail design an appropriate trail system and associated mitigation measures in accordance with the City's design and development standards.
5. **Grading and drainage:**
    - Provide preliminary grading and drainage plans to demonstrate that the design of the park block, trail connection and open space meets City's standards.
6. **Open space restoration and enhancement:**
    - The owner will be responsible for implementation of City approved landscape plans in accordance with the EIR including, but not limited to, restoration, compensation and enhancement planting within the open space.
7. **Demarcation of public open space:**
    - Describe the recommended approach to demarcate existing and proposed public park and open spaces, if any, within and adjacent to the subject property.
8. **Public education:**
    - Recommend provision of public education through educational/ interpretive signage at the entry points to the trail and open space system. Public education should address the environmental sensitivity of natural Heritage features and procedures residents can follow to protect and/or enhance these areas.
    - City will review and approve the design and locations of interpretive and educational signage, to be included on landscape plans.

Summary:

Revise the Terms of Reference for scoped EIS, to address Parks comments above, for our further review.

Please contact me if you have any questions.

Sincerely,

Jyoti Pathak,
Parks Planner

Parks and Recreation
Public Services
Location: City Hall
T 519-822-1260 x 2431
E Jyoti.pathak@guelph.ca

From: Fred Natolochny <fnatolochny@grandriver.ca>
Sent: Wednesday, October 17, 2018 10:11 AM
To: Leah Lefler
Subject: FW: 1242, 1250, 1260 Gordon St. 9 Valley Rd. Guelph

From our ecologist. Can you also send me the original message again – I appear to have mis-filed it. Sorry

---

From: Robert Messier
Sent: October 16, 2018 9:06 AM
To: Fred Natolochny
Subject: 1242, 1250, 1260 Gordon St. 9 Valley Rd. Guelph

I have reviewed the ToR EIS for the redevelopment of 1242, 1250, 1260 Gordon St. and 9 Valley Rd. in Guelph. As part of the background review they should also look at the Torrence Creek Subwatershed study and the Hanlon Creek subwatershed study. For the monitoring plan they should include a post construction monitoring of SWM design and mitigation. The setbacks and buffers assigned to the development should factor in the community trail that will be built even though the trail will ultimately be completed by the City. If you have any questions please let me know

Robert Messier
Ecologist
Grand River Conservation Authority
400 Clyde Road
Cambridge, Ontario N1R 5W6
(519) 621-2763 x2310
www.grandriver.ca

APPENDIX F
TREE PRESERVATION PLAN

9 Valley Road, 1242, 1250, and 1260 Gordon Street, Guelph

Tree Preservation Plan

Prepared for:

Tricar Developments Inc.
3800 Colonel Talbot Road,
London, ON N6P 1H5

Project No. 2347A | March 2020

Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists

9 Valley Road, 1242, 1250, and 1260 Gordon Street, Guelph

Tree Preservation Plan

Project Team

David Stephenson	Senior Biologist, Project Advisor
Ken Burrell	Terrestrial & Wetland Biologist, Project Manager
Jeremy Bannon	Terrestrial & Wetland Biologist, Certified Arborist
Kaitlin Filippov	GIS Analyst

Report submitted on March 27, 2020

David Stephenson, M.Sc.
Senior Biologist and Certified Arborist

Ken Burrell, M.E.S.
Terrestrial and Wetlands Biologist

Jeremy Bannon, B.E.S.
Certified Arborist ON-1921A
Terrestrial and Wetland Biologist

Table of Contents

List of Appendices

Maps

1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in October 2019 by Tricar Developments Inc. to complete a Tree Preservation Plan (TPP) for a proposed residential development located at 9 Valley Road, 1242, 1250, and 1260 Gordon Street, in the City of Guelph.

NRSI was previously retained in 2014 by the previous landowner to complete a variety of natural heritage studies in support of a development proposal. As part of these studies, NRSI completed a tree inventory of the subject property. Before the development proposal was realized, the property was sold to Tricar Developments Inc. This Tree Preservation Plan represents updated information incorporating the original inventory data with more recent inventory data provided by Stantec Consulting (Stantec Consulting 2020).

The subject property is approximately 3.67ha in area and contains 3 existing residential dwellings, driveways, cultural meadows, cultural plantations, and other planted and naturally regenerating trees. The subject property is bound by Gordon Street to the west, residential dwellings fronting Valley Road to the north, the Torrence Creek Swamp Provincially Significant Wetland Complex to the east, and the Liberty Square apartment complex to the south. Rectangular in shape, the subject property includes an additional lot extending north to Valley Road (Map 1).

The Tree Preservation Plan was conducted in accordance with the City of Guelph By-law (2010)-19058. This by-law states that if an owner wishes to destroy or injure a regulated tree and if none of the exemptions set out in this by-law are applicable, then the owner shall submit the information required in Part 5 of the by-law, including a Landscaping, Replanting and Replacement Plan. Within the By-law, a regulated tree is defined as

> "*a specimen of any species of deciduous or coniferous growing woody perennial plant, supported by a single root system, which has reached, or could have reached a height at least 4.5m from the ground at physiological maturity, is located on a lot that is greater than 0.2 hectares (0.5 acres) in size and has a [Diameter at Breast Height] (DBH) of at least 10cm".*

According to the By-law, the destruction or injury of a regulated tree is exempt from the requirement for a permit if the regulated tree is:

- "*A tree on lands used for Institution, golf course, commercial or industrial purposes, provided that a Tree Management Plan has been submitted to, and approved, by an*

> *Inspector, subject to such as the Inspector may have considered necessary" [Part 4, section (k)].*

The City of Guelph's Official Plan (City of Guelph 2018) also requires that a Tree Inventory and Preservation Plan be required for the replacement of all healthy indigenous trees measuring over 10cm DBH.

Section 4.2.4 Tree Inventory and Tree Preservation Plan within the Official Plan notes:

1. *"Tree Inventory and Tree Preservation Plans shall as a minimum include:*
    - *i) A Tree Inventory measuring all trees over 10cm diameter at breast height [DBH], including the size, species composition and health, and indigenous shrubs in accordance with the City's tree inventory guidelines,*
    - *ii) A Tree Preservation Plan identifying healthy indigenous and non-invasive trees to be protected, including those that may be transplanted (e.g. small specimens),*
    - *iii) The protective measures required for tree protection during construction, and*
    - *iv) Measures for avoiding disturbance to any breeding birds during construction"*

This report provides the findings of the tree inventory, analysis of grading, servicing and site plans against the overall health and the potential for structural failure of trees, protection measures for trees to be retained, and recommended mitigation and compensation measures. The tree data and mapping has been compared to the layout of the proposed site plan. Map 2 shows the tree inventory data overlaying the proposed site plan. This plan shows the proposed building layout, and trees inventoried. Avoidance, mitigation, and protection measures for trees were examined to determine which trees would be impacted and which could be retained. In the case of trees requiring removal, compensation for removal is discussed.

This report summarizes the following:

- findings of the tree inventory,
- assessment of overall health and potential for structural failure of inventoried trees,
- tree retention analysis based on the preliminary site plan, and, recommended tree protection, mitigation and compensation measures.

Butternut (*Juglans cinerea*) is Endangered Provincially and is therefore regulated by the Ministry of Environment, Conservation and Parks (MECP). Several Butternut are known to occur on the subject property, which will require removal or potential impact. Correspondence and permitting processes will be required with the MECP to facilitate the proposed site plan. Removal of trees, as well as any impacts to a 50m radius of a Butternut requires a Butternut Health Assessment and, depending on the results, specific permitting and compensation discussions with the MECP. This report, and any approval of this report received by the City of Guelph, does not constitute approval for Species at Risk destruction or impact, which is regulated by the MECP. This process is underway for the identified Butternuts, and is outside of the scope of this Plan.

2.0 Tree Inventory and Methodology

Comprehensive inventories of trees ≥10cm in DBH have been completed routinely on the subject property. Since NRSI completed an original tree inventory in 2014, Stantec has completed an updated inventory of all trees on the subject property in 2018 and 2019 (Stantec Consulting 2020). NRSI completed a site visit on December 19, 2019 to verify tree information, and subsequently compiled original NRSI data with the updated information provided by Stantec, accounting for a complete set of tree inventory data. Some inventories were conducted in the leaf-off period; therefore, NRSI was able to assess the overall health and potential for structural failure of trees within the subject property, but not the foliar characteristics of deciduous individuals. Individual trees that were ≥10cm in DBH were tagged with a pre-numbered aluminum forestry tag (if located on the subject property) and assessed by a Certified Arborist. If trees were present in monoculture hedgerow features, a polygon method was used. The location of trees inventoried was surveyed using an SXBlue II GNSS GPS unit by the Certified Arborist and are shown on Map 2. A complete list of the trees that were assessed and their overall health and potential for structural failure is included in Appendix I. No bat habitat assessments were completed in conjunction with the tree assessments.

The following information was recorded for each tree:

- species,
- DBH,
- crown radius (metres),
- general health (excellent, good, fair, poor, very poor, dead),
- potential for structural failure (improbable, possible, probable, imminent),
- tree location (on-site/boundary/off-site), and,
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

The overall health and potential for structural failure of each tree was assessed based on the criteria outlined in Appendix II (Dunster 2009) (Dunster et al. 2013). NRSI has exercised a reasonable standard of care, skill and diligence as would be customarily and normally provided in carrying out these assessments. The assessments have been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. None of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken. The conditions for this assessment, including restrictions, professional responsibility, and third-party liability can be found in Appendix III.

3.0 Summary of Tree Inventory Findings

In total, 707 trees were inventoried, comprising 9 species. Of the trees inventoried and assessed, 475 (67.2%) are native species and 232 (32.8%) are non-native. Several Eastern White Cedar (*Thuja occidentalis*) hedgerows are present, as well as a hedgerow of Freeman's Maple (*Acer* X *freemanii*) and Norway Spruce (*Picea abies*). These trees were inventoried as groups (Polygon A-F) due to the similarity of species, location, age and conditions. A complete list of trees inventoried is provided in Appendix I, with summarizing tables in Appendix IV. Tree locations within and adjacent to the subject property are shown on Map 2.

4.0 Tree Protection Measures and Recommended Mitigation

Tree removal and retention was based on two considerations:

1) Trees identified as having a probable or imminent potential for structural failure or poor or very poor health, or identified as dead: The removal of these trees may be recommended for safety, especially if they are located within striking distance of a component of the proposed development, or existing off-site pathways, roads or buildings.
2) Trees that require removal based on the extent of proposed site grading: The location of the trees was compared to the location of the components of the grading plan, as shown on Map 2 (Stantec 2020).

Of the 707 trees inventoried, 606 are anticipated to be removed. This includes trees situated along the grading limit or in close proximity that may incur root damage as a result of grading. Most of these trees are in fair health with an improbable potential for structural failure, and range in size from 10cm DBH to 105cm DBH.

Removal of boundary, off-site and municipal trees will require the permission of all owners involved. If the main stem of any tree is located on multiple properties, all owners of those properties must be consulted before any tree removal occurs.

5.0 Tree Compensation Plan

Section 5 (h) in the City's tree by-law (2010)-19058 states that "where three or more trees are proposed for Destruction or Injuring, and where the Inspector so requires, a Landscaping, Replanting and Replacement Plan" is required. Overall compensation for tree loss is a requirement of the City's by-law which notes that "each tree Destroyed or Injured be replaced with one or more replacements trees to be planted and maintained to the satisfaction of the Inspector in accordance with the Landscaping, Replanting and Replacement Plans approved by the Inspector" [Section 7 (b)].

According to City of Guelph Tree By-law Number (2010)-19058, trees exempt from compensation must have the following site-specific criteria:

"A tree having no living tissue, having 70% or more of its crown dead, or being infected by a lethal pathogen, fungus or insect (including the Emerald Ash Borer or the Asian Long-horned Beetle), and where required, a certificate issued by an Arborist, confirming this justification for Destruction or Injuring, has been submitted to an Inspector" [Part 4, section (a)],

"A tree which is Hazardous, and where required, a certificate issued by an Arborist, confirming this justification for Destruction or Injuring, has been submitted to an Inspector" [Part 4, section (b)]

"A specimen of *Rhamnus cathartica* (Common Buckthorn), *Rhamnus frangula* (Glossy Buckthorn), *Alnus glutinosa* (Black Alder), *Elaeagnus umbellata* (Autumn Olive), or *Morus alba* (White Mulberry)" [Part 4, section (g)],

"A fruit tree that is capable of producing fruit for human consumption" [Part 4, section (h)].

A total of 3 trees require removal based on their structural integrity, and an additional 8 trees are also in poor or very poor health. Table 1 provides a summary of the trees inventoried throughout and adjacent to the property, total number proposed for removal and the proposed compensation plan. A complete list of inventoried trees, including a determination of whether trees require compensation, is provided in Appendix I.

Table 1. Summary of Trees to be Removed and Recommended Compensation Plan

Trees Inventoried	Total
ROW Trees	3
Off-Site Privately Owned Trees	3
Boundary Trees	35

On-Site Trees	666
Total number of trees inventoried	707
Tree Compensation Break Down	
Total Trees to be Removed	606
Trees to be removed due to their structural condition (exempt from compensation)	88
Fair-good quality on-site trees to be removed due to development	512
Fair-good quality off-site or boundary private trees to be removed due to development	4
Fair-good quality public trees to be removed due to development	2
Trees requiring compensation (private)	516
Trees requiring compensation (ROW)	2

Compensation for the 516 private trees and 2 public trees may be in the form of 3:1 replacement 60mm caliper trees, $500 cash-in-lieu value, 5:1 shrubs, or 5:1 of smaller stock trees. Most likely, a combination of these methods will be used. Other compensation measures may be discussed with the City, and should be finalized in the Detailed Design stage. The retention analysis should also be refined at the Detailed Design stage, if necessary.

6.0 Tree Protection Measures and Recommended Mitigation

6.1 Prior to Construction

Temporary tree protection fencing (TPF) will be situated where trees are adjacent to the limit of disturbance/grading as shown on Map 2. The temporary TPF will be installed and maintained by the Developer. Prior to any construction activities (rough grading, vegetation and tree removal), the TPF will be installed at the limit of development. Prior to works commencing on-site, fence installation and location is to be inspected by a Certified Arborist and/or the on-site Environmental Inspector. Signage indicating the purpose of protection fencing will be attached to the paige-wire fencing every 100-150m. Recommended fencing locations are along the property edge, as shown on Map 2.

The Tree Protection Plan is to be reviewed and approved by the City of Guelph. Upon approval of the Tree Protection Plan, and prior to any on-site works (i.e. rough grading, tree removal), a qualified environmental consultant is to submit written verification to the City that all of the recommended tree protection measures have been installed in accordance with the Tree Protection Plan.

6.2 During Construction

Temporary TPF is to be maintained by the Developer during the entire construction period to ensure that off-site trees being retained and their root systems are protected. Any minimal damage (i.e. damage to limbs or roots) to trees to be retained during construction must be pruned using proper arboricultural techniques. Should any of the trees intended to be retained be seriously damaged or die as a result of construction activities, the owner will remove and replace the tree at their own expense at a 3:1 ratio. Replacement species are to be reviewed by a Certified Ontario Landscape Architect (OLA) or Certified Arborist. Watering and pruning of newly planted trees will be carried out by the owner/contractor as required during the warranty period (approximately 2 years).

6.3 Post-Construction

As trees being retained are situated beyond the property line, it is recommended that the temporary tree protection fencing be removed upon completion of all construction activities and adjacent areas are stabilized with a vegetative cover (i.e. sod) to the satisfaction of the Environmental Inspector or qualified biologist.

7.0 References

City of Guelph. 2010. The Official Plan of The City of Guelph By-law Number (2010)-19058.

City of Guelph. 2018. The City of Guelph Official Plan, March 2018 Consolidation. (https://guelph.ca/plans-and-strategies/official-plan/).

Dunster, J. A. 2009. Tree Risk Assessment in Urban Areas and the Urban/Rural Interface: Course Manual. Pacific Northwest Chapter, International Society of Arboriculture, Silverton, Oregon.

Dunster, J. A., E. T. Smiley, N. Matheny, and S. Lily. 2013. Tree Risk Assessment Manual. International Society of Arboriculture, Champaign, Illinois.

Stantec Consulting. 2020. 9 Valley Road, 1242, 1250, and 1260 Gordon Street Tree Inventory Data.

Appendix I
Tree Inventory Data

1250 Gordon Street Tree Preservation Plan

Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action
77	Hawthorn species	*Crataegus sp.*	Native	1	12	2.0	High	Fair	Subject Property	Retain
78	Hawthorn Species	*Crataegus sp.*	Native	2	12	2.0	Medium	Fair	Subject Property	Retain
79	White Elm	*Ulmus americana*	Native	1	15	3.5	Low	Good	Subject Property	Retain
80	White Elm	*Ulmus americana*	Native	1	16	1.0	High	Dead	Subject Property	Retain
101	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	65	7.0	Medium	Fair	Boundary	Retain
102	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	46	5.0	Medium	Fair	Subject Property	Retain
103	White Spruce	*Picea glauca*	Native	1	24	3.0	Medium	Fair	Boundary	Retain
104	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	60	6.0	High	Poor	Boundary	Retain
105	Norway Maple	*Acer platanoides*	Non-Native	1	20	3.5	Medium	Fair	Boundary	Retain
106	Manitoba Maple	*Acer negundo*	Native	1	22	4.0	Medium	Fair	Boundary	Retain
107	Eastern White Cedar	*Thuja occidentalis*	Native	2	11	1.5	High	Poor	Boundary	Retain
108	Eastern White Cedar	*Thuja occidentalis*	Native	2	10	1.0	Medium	Poor	Boundary	Retain
109	Black Walnut	*Juglans nigra*	Native	1	21	5.0	Medium	Fair	Subject Property	Retain
110	Eastern White Cedar	*Thuja occidentalis*	Native	1	14	2.5	Medium	Fair	Subject Property	Retain
111	Eastern White Cedar	*Thuja occidentalis*	Native	1	23	2.5	Medium	Fair	Subject Property	Retain
112	Norway Spruce	*Picea abies*	Non-Native	1	56	4.0	Medium	Fair	Subject Property	Remove
113	Common Pear	*Pyrus communis*	Non-Native	1	27	3.0	High	Very Poor	Subject Property	Remove
114	Eastern White Cedar	*Thuja occidentalis*	Native	1	22	2.0	High	Poor	Subject Property	Remove
115	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	1.0	High	Poor	Subject Property	Remove
116	Eastern White Cedar	*Thuja occidentalis*	Native	1	14	1.0	High	Poor	Subject Property	Remove
117	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.0	High	Poor	Subject Property	Remove
118	Eastern White Cedar	*Thuja occidentalis*	Native	2	12	2.0	High	Poor	Subject Property	Remove
119	Eastern White Cedar	*Thuja occidentalis*	Native	2	17	1.0	High	Poor	Subject Property	Remove
120	Eastern White Cedar	*Thuja occidentalis*	Native	1	16	2.0	High	Poor	Subject Property	Remove
121	Eastern White Cedar	*Thuja occidentalis*	Native	1	17	1.5	High	Poor	Subject Property	Remove
122	White Elm	*Ulmus americana*	Native	1	37	5.0	Low	Good	Boundary	Remove
123	Eastern White Cedar	*Thuja occidentalis*	Native	2	14	3.0	Medium	Fair	Subject Property	Remove
124	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	1.0	High	Poor	Boundary	Remove
125	Eastern White Cedar	*Thuja occidentalis*	Native	2	21	3.0	High	Poor	Subject Property	Remove
126	Eastern White Cedar	*Thuja occidentalis*	Native	1	30	3.0	High	Poor	Subject Property	Remove
127	Eastern White Cedar	*Thuja occidentalis*	Native	2	21	3.0	High	Poor	Subject Property	Remove
128	Eastern White Cedar	*Thuja occidentalis*	Native	1	16	1.0	High	Poor	Subject Property	Remove
129	Norway Spruce	*Picea abies*	Non-Native	1	36	4.0	Low	Fair	Subject Property	Remove
130	Eastern White Cedar	*Thuja occidentalis*	Native	1	19	1.5	Medium	Fair	Subject Property	Remove
131	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	2.0	Medium	Fair	Subject Property	Remove
132	Norway Spruce	*Picea abies*	Non-Native	1	16	3.0	High	Poor	Subject Property	Remove
133	Norway Spruce	*Picea abies*	Non-Native	1	28	4.0	Low	Good	Subject Property	Remove
134	Norway Spruce	*Picea abies*	Non-Native	1	38	4.0	Medium	Fair	Subject Property	Remove
135	Norway Spruce	*Picea abies*	Non-Native	1	21	3.0	High	Poor	Subject Property	Remove
136	Common Pear	*Pyrus communis*	Non-Native	1	23	4.0	High	Poor	Subject Property	Remove
137	Common Apple	*Malus domestica*	Non-Native	3	29	5.0	High	Poor	Subject Property	Remove
138	Common Apple	*Malus domestica*	Non-Native	1	22	5.0	High	Poor	Subject Property	Remove
139	Norway Spruce	*Picea abies*	Non-Native	1	51	5.0	Low	Good	Subject Property	Remove
140	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	3.0	Medium	Fair	Subject Property	Remove
141	Eastern White Cedar	*Thuja occidentalis*	Native	4	21	1.5	Medium	Fair	Subject Property	Remove
142	Eastern White Cedar	*Thuja occidentalis*	Native	2	12	2.0	High	Poor	Subject Property	Remove
143	Eastern White Cedar	*Thuja occidentalis*	Native	2	16	2.0	High	Poor	Subject Property	Remove
144	Eastern White Cedar	*Thuja occidentalis*	Native	1	17	1.0	Medium	Fair	Subject Property	Remove
145	Eastern White Cedar	*Thuja occidentalis*	Native	2	19	3.0	High	Poor	Subject Property	Remove
146	Eastern White Cedar	*Thuja occidentalis*	Native	2	19	2.0	Medium	Fair	Subject Property	Remove
147	Common Apple	*Malus domestica*	Non-Native	1	53	5.0	Medium	Fair	Subject Property	Remove
148	Colorado Spruce	*Picea pungens*	Non-Native	1	11	1.5	Low	Excellent	Subject Property	Remove
149	Norway Maple	*Acer platanoides*	Non-Native	1	25	5.0	Medium	Fair	Subject Property	Remove
150	Colorado Spruce	*Picea pungens*	Non-Native	1	10	1.0	High	Dead	Subject Property	Remove
151	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	61	5.0	Medium	Fair	Subject Property	Remove
152	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	53	5.0	Medium	Fair	Subject Property	Remove
153	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	64	5.0	High	Poor	Subject Property	Remove
154	White Ash	*Fraxinus americana*	Native	1	23	4.0	Low	Good	Subject Property	Remove
155	Norway Spruce	*Picea abies*	Non-Native	1	43	3.0	Low	Good	Subject Property	Remove
156	Eastern White Cedar	*Thuja occidentalis*	Native	2	24	4.0	Medium	Fair	Subject Property	Remove
157	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	1.5	High	Poor	Subject Property	Remove
158	Norway Spruce	*Picea abies*	Non-Native	1	45	4.0	Low	Good	Subject Property	Remove
159	Norway Spruce	*Picea abies*	Non-Native	1	40	4.0	Low	Good	Subject Property	Remove
160	Norway Spruce	*Picea abies*	Non-Native	1	32	2.0	Medium	Fair	Subject Property	Remove
161	Eastern White Cedar	*Thuja occidentalis*	Native	3	18	3.5	High	Dead	Subject Property	Remove
162	Eastern White Cedar	*Thuja occidentalis*	Native	2	19	2.0	High	Dead	Subject Property	Remove
163	Norway Spruce	*Picea abies*	Non-Native	1	38	4.0	Low	Good	Subject Property	Remove
164	Eastern White Cedar	*Thuja occidentalis*	Native	1	16	2.0	Medium	Fair	Subject Property	Remove
165	Norway Spruce	*Picea abies*	Non-Native	1	29	3.0	Low	Good	Subject Property	Remove
166	Norway Spruce	*Picea abies*	Non-Native	1	36	3.5	Medium	Fair	Subject Property	Remove
167	Norway Spruce	*Picea abies*	Non-Native	1	15	2.0	Medium	Fair	Subject Property	Remove
168	Norway Spruce	*Picea abies*	Non-Native	1	40	4.0	Low	Good	Subject Property	Remove
169	Norway Spruce	*Picea abies*	Non-Native	1	14	1.0	High	Dead	Subject Property	Remove
170	Norway Spruce	*Picea abies*	Non-Native	1	28	3.5	Medium	Fair	Subject Property	Remove
171	Norway Spruce	*Picea abies*	Non-Native	1	25	5.0	Medium	Fair	Subject Property	Remove
172	Norway Spruce	*Picea abies*	Non-Native	1	27	3.0	Medium	Fair	Subject Property	Remove
173	Siberian Elm	*Ulmus pumila*	Non-Native	1	52	8.0	Medium	Fair	Boundary	Retain
174	European Weeping Birch	*Betula pendula*	Non-Native	2	26	4.0	Medium	Fair	Public	Remove
175	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	43	6.0	Medium	Fair	Public	Remove
176	Honey Locust	*Gleditsia triacanthos*	Native	1	40	6.0	Medium	Fair	Public	Retain
177	Honey Locust	*Gleditsia triacanthos*	Native	1	21	5.0	Medium	Fair	Off-Property	Retain
178	Honey Locust	*Gleditsia triacanthos*	Native	1	14	4.0	Medium	Fair	Off-Property	Retain
179	Norway Spruce	*Picea abies*	Non-Native	1	41	4.0	Medium	Fair	Boundary	Retain

1250 Gordon Street Tree Preservation Plan

Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action
180	Norway Maple	*Acer platanoides*	Non-Native	1	67	6.0	High	Poor	Boundary	Retain
181	Tamarack	*Larix laricina*	Native	1	30	4.0	Medium	Fair	Boundary	Retain
182	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	53	7.0	Medium	Fair	Subject Property	Retain
183	Norway Maple	*Acer platanoides*	Non-Native	1	51	7.0	Medium	Fair	Subject Property	Prune
184	American Basswood	*Tilia americana*	Native	3	42	6.0	Medium	Fair	Subject Property	Remove
185	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	17	4.0	Low	Good	Boundary	Remove
186	Linden	*Tilia sp.*	Non-Native	1	28	5.0	Medium	Fair	Subject Property	Remove
187	Common Apple	*Malus domestica*	Non-Native	1	44	4.0	High	Poor	Subject Property	Remove
188	Linden	*Tilia sp.*	Non-Native	1	19	3.0	Medium	Fair	Subject Property	Remove
189	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	47	5.0	Medium	Fair	Subject Property	Remove
190	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	1.0	Low	Good	Subject Property	Remove
191	Eastern White Cedar	*Thuja occidentalis*	Native	2	20	1.0	Medium	Fair	Subject Property	Remove
192	Eastern White Cedar	*Thuja occidentalis*	Native	3	16	2.0	Medium	Fair	Subject Property	Remove
193	Norway Spruce	*Picea abies*	Non-Native	1	50	3.5	Low	Excellent	Subject Property	Remove
194	Norway Spruce	*Picea abies*	Non-Native	1	52	3.0	Low	Good	Subject Property	Remove
195	Linden	*Tilia sp.*	Non-Native	1	22	3.5	Medium	Fair	Subject Property	Remove
196	Norway Spruce	*Picea abies*	Non-Native	1	35	3.0	Low	Excellent	Subject Property	Remove
197	Linden	*Tilia sp.*	Non-Native	1	23	4.0	Medium	Fair	Subject Property	Remove
198	Norway Spruce	*Picea abies*	Non-Native	1	39	3.0	Low	Excellent	Subject Property	Remove
199	Linden	*Tilia sp.*	Non-Native	1	13	3.0	Medium	Fair	Subject Property	Remove
200	Norway Spruce	*Picea abies*	Non-Native	1	34	3.0	Low	Good	Subject Property	Remove
201	Norway Spruce	*Picea abies*	Non-Native	1	41	5.0	Medium	Fair	Subject Property	Remove
202	Norway Spruce	*Picea abies*	Non-Native	1	19	2.0	High	Poor	Subject Property	Remove
203	Norway Spruce	*Picea abies*	Non-Native	2	14	1.0	High	Dead	Subject Property	Remove
204	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	52	7.0	Medium	Fair	Subject Property	Remove
205	Norway Spruce	*Picea abies*	Non-Native	1	15	1.5	Medium	Fair	Subject Property	Remove
206	Norway Spruce	*Picea abies*	Non-Native	1	15	2.0	Medium	Fair	Subject Property	Remove
207	Norway Spruce	*Picea abies*	Non-Native	2	21	2.0	Medium	Poor	Subject Property	Remove
208	Norway Spruce	*Picea abies*	Non-Native	1	27	3.0	Medium	Fair	Subject Property	Remove
209	Norway Spruce	*Picea abies*	Non-Native	1	23	2.0	Medium	Poor	Subject Property	Remove
210	Scots Pine	*Pinus sylvestris*	Non-Native	1	36	4.0	High	Poor	Subject Property	Remove
211	Common Apple	*Malus domestica*	Non-Native	1	37	6.0	Medium	Fair	Subject Property	Remove
212	Norway Spruce	*Picea abies*	Non-Native	1	32	4.0	Low	Good	Subject Property	Remove
213	Norway Spruce	*Picea abies*	Non-Native	1	24	3.0	Medium	Fair	Subject Property	Remove
214	Norway Spruce	*Picea abies*	Non-Native	1	36	4.0	Low	Good	Subject Property	Remove
215	Norway Spruce	*Picea abies*	Non-Native	1	41	4.0	Low	Good	Subject Property	Remove
216	Scots Pine	*Pinus sylvestris*	Non-Native	1	38	4.0	Medium	Fair	Subject Property	Remove
217	Norway Spruce	*Picea abies*	Non-Native	1	26	2.0	Medium	Fair	Subject Property	Remove
218	Norway Maple	*Acer platanoides*	Non-Native	1	40	4.0	Medium	Fair	Subject Property	Remove
219	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	Medium	Fair	Subject Property	Remove
220	Norway Spruce	*Picea abies*	Non-Native	1	32	3.0	Low	Good	Subject Property	Remove
221	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	Medium	Fair	Subject Property	Remove
222	Norway Spruce	*Picea abies*	Non-Native	1	43	3.0	Medium	Fair	Subject Property	Remove
223	Norway Spruce	*Picea abies*	Non-Native	1	35	3.0	Medium	Fair	Subject Property	Remove
224	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	High	Dead	Subject Property	Remove
225	Black Walnut	*Juglans nigra*	Native	1	42	4.0	High	Poor	Subject Property	Remove
226	Pine Species	*Pinus sp.*	Non-Native	3	18	3.0	Medium	Fair	Subject Property	Remove
227	Black Walnut	*Juglans nigra*	Native	1	65	6.0	Medium	Fair	Subject Property	Remove
228	Scots Pine	*Pinus sylvestris*	Non-Native	1	53	6.0	High	Poor	Subject Property	Remove
229	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	Medium	Fair	Subject Property	Remove
230	Freeman's Maple	*Acer X freemanii*	Native	1	56	6.0	Medium	Fair	Subject Property	Remove
231	Scots Pine	*Pinus sylvestris*	Non-Native	1	42	3.0	Low	Good	Subject Property	Remove
233	Scots Pine	*Pinus sylvestris*	Non-Native	1	29	2.5	Low	Good	Subject Property	Retain
235	Scots Pine	*Pinus sylvestris*	Non-Native	1	23	3.0	Medium	Fair	Subject Property	Retain
236	Scots Pine	*Pinus sylvestris*	Non-Native	1	15	2.5	Low	Good	Subject Property	Retain
237	Scots Pine	*Pinus sylvestris*	Non-Native	1	16	2.5	Medium	Fair	Subject Property	Retain
238	Scots Pine	*Pinus sylvestris*	Non-Native	2	19	3.0	Medium	Fair	Subject Property	Retain
239	Scots Pine	*Pinus sylvestris*	Non-Native	1	11	1.0	Medium	Good	Subject Property	Retain
240	Scots Pine	*Pinus sylvestris*	Non-Native	1	14	2.0	Medium	Fair	Subject Property	Retain
241	Scots Pine	*Pinus sylvestris*	Non-Native	1	11	1.0	Low	Good	Subject Property	Retain
242	Scots Pine	*Pinus sylvestris*	Non-Native	1	12	1.0	Medium	Fair	Subject Property	Retain
243	Scots Pine	*Pinus sylvestris*	Non-Native	1	20	3.0	Medium	Fair	Subject Property	Remove
244	Scots Pine	*Pinus sylvestris*	Non-Native	1	17	2.0	Low	Good	Subject Property	Retain
245	Scots Pine	*Pinus sylvestris*	Non-Native	1	23	2.0	Low	Good	Subject Property	Remove
246	Black Walnut	*Juglans nigra*	Native	1	21	3.5	Medium	Fair	Subject Property	Remove
247	Norway Spruce	*Picea abies*	Non-Native	1	20	2.0	Low	Excellent	Subject Property	Remove
248	White Spruce	*Picea glauca*	Native	1	12	1.5	Low	Excellent	Subject Property	Remove
249	White Spruce	*Picea glauca*	Native	1	12	1.5	Low	Good	Subject Property	Remove
250	Eastern White Cedar	*Thuja occidentalis*	Native	1	14	1.5	Low	Good	Subject Property	Remove
251	Eastern White Cedar	*Thuja occidentalis*	Native	1	22	2.0	Low	Good	Subject Property	Remove
252	Black Walnut	*Juglans nigra*	Native	1	10	1.5	Medium	Fair	Subject Property	Remove
253	Scots Pine	*Pinus sylvestris*	Non-Native	1	13	1.5	Low	Good	Subject Property	Remove
254	Scots Pine	*Pinus sylvestris*	Non-Native	1	17	2.0	Low	Good	Subject Property	Remove
255	Common Pear	*Pyrus communis*	Non-Native	3	12	1.0	High	Poor	Subject Property	Remove
256	Scots Pine	*Pinus sylvestris*	Non-Native	1	30	2.5	Low	Good	Subject Property	Remove
257	Scots Pine	*Pinus sylvestris*	Non-Native	1	21	2.5	Low	Good	Subject Property	Remove
258	Common Pear	*Pyrus communis*	Non-Native	2	16	2.5	Medium	Poor	Subject Property	Remove
259	Common Apple	*Malus domestica*	Non-Native	3	32	4.0	Medium	Poor	Subject Property	Remove
260	Black Maple	*Acer saccharum ssp. nigrum*	Native	1	14	3.0	High	Poor	Subject Property	Remove
261	Green Ash	*Fraxinus pennsylvanica*	Native	1	27	5.0	Low	Good	Subject Property	Remove
262	Butternut	*Juglans cinerea*	Native	1	28	5.0	Medium	Fair	Subject Property	Remove
263	Green Ash	*Fraxinus pennsylvanica*	Native	1	23	3.0	Medium	Poor	Subject Property	Remove
264	Green Ash	*Fraxinus pennsylvanica*	Native	1	10	2.0	Low	Fair	Subject Property	Remove
265	White Spruce	*Picea glauca*	Native	1	23	3.0	Medium	Fair	Subject Property	Remove
266	Black Maple	*Acer saccharum ssp. nigrum*	Native	1	105	9.0	High	Poor	Subject Property	Remove
267	Green Ash	*Fraxinus pennsylvanica*	Native	1	12	2.0	Low	Good	Subject Property	Remove
268	Black Maple	*Acer saccharum ssp. nigrum*	Native	1	19	4.0	High	Poor	Subject Property	Remove
269	Black Maple	*Acer saccharum ssp. nigrum*	Native	1	12	2.0	High	Poor	Subject Property	Remove
270	Black Maple	*Acer saccharum ssp. nigrum*	Native	1	11	2.5	High	Poor	Subject Property	Remove
271	Red Oak	*Quercus rubra*	Native	1	52	7.0	Medium	Fair	Subject Property	Remove

1250 Gordon Street Tree Preservation Plan

Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action
272	Red Oak	*Quercus rubra*	Native	1	20	2.0	High	Very Poor	Subject Property	Remove
273	Red Oak	*Quercus rubra*	Native	1	23	5.0	Medium	Fair	Subject Property	Remove
274	Red Oak	*Quercus rubra*	Native	1	13	1.5	Low	Good	Subject Property	Remove
276	Red Oak	*Quercus rubra*	Native	1	65	8.0	Low	Fair	Subject Property	Remove
277	Red Oak	*Quercus rubra*	Native	1	18	4.0	Low	Fair	Subject Property	Remove
278	Red Oak	*Quercus rubra*	Native	1	21	4.0	Medium	Fair	Subject Property	Remove
279	Red Oak	*Quercus rubra*	Native	1	13	4.0	Medium	Fair	Subject Property	Remove
280	Red Oak	*Quercus rubra*	Native	1	11	2.0	Medium	Fair	Subject Property	Remove
281	Norway Spruce	*Picea abies*	Non-Native	1	10	1.0	High	Dead	Subject Property	Remove
282	Red Oak	*Quercus rubra*	Native	1	65	8.0	Medium	Fair	Subject Property	Remove
283	Norway Spruce	*Picea abies*	Non-Native	1	16	2.5	Medium	Poor	Subject Property	Remove
284	Norway Spruce	*Picea abies*	Non-Native	1	18	4.0	Medium	Fair	Subject Property	Remove
285	Norway Spruce	*Picea abies*	Non-Native	1	23	3.0	Medium	Fair	Subject Property	Remove
286	Norway Spruce	*Picea abies*	Non-Native	1	16	2.5	Medium	Fair	Subject Property	Remove
287	Norway Spruce	*Picea abies*	Non-Native	1	18	1.5	Medium	Poor	Subject Property	Remove
288	Norway Spruce	*Picea abies*	Non-Native	1	13	1.5	Medium	Poor	Subject Property	Remove
289	American Basswood	*Tilia americana*	Native	1	25	4.0	Medium	Fair	Subject Property	Remove
290	Norway Spruce	*Picea abies*	Non-Native	1	11	1.5	Medium	Fair	Subject Property	Remove
291	Norway Spruce	*Picea abies*	Non-Native	1	35	5.0	Low	Good	Subject Property	Remove
292	Norway Spruce	*Picea abies*	Non-Native	1	15	1.0	Medium	Fair	Subject Property	Remove
293	Norway Spruce	*Picea abies*	Non-Native	1	35	3.5	Low	Good	Subject Property	Remove
294	Norway Spruce	*Picea abies*	Non-Native	1	27	3.0	High	Poor	Subject Property	Remove
295	Norway Maple	*Acer platanoides*	Non-Native	2	19	3.0	High	Poor	Subject Property	Remove
296	Norway Spruce	*Picea abies*	Non-Native	1	32	4.0	Low	Good	Subject Property	Remove
297	Norway Spruce	*Picea abies*	Non-Native	1	40	4.0	Low	Good	Subject Property	Remove
298	Fir species	*Abies sp.*	Non-Native	1	37	4.0	Medium	Fair	Subject Property	Remove
299	Balsam Fir	*Abies balsamea*	Native	1	15	2.0	Low	Good	Subject Property	Remove
300	Black Walnut	*Juglans nigra*	Native	1	12	1.5	Low	Good	Subject Property	Remove
301	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	Low	Good	Subject Property	Remove
302	Crack Willow	*Salix fragilis*	Non-Native	1	73	5.0	High	Poor	Subject Property	Remove
303	Red Maple	*Acer rubrum*	Native	1	12	1.0	High	Dead	Subject Property	Remove
304	White Elm	*Ulmus americana*	Native	1	11	4.0	High	Poor	Subject Property	Remove
305	Manitoba Maple	*Acer negundo*	Native	1	10	2.0	High	Poor	Subject Property	Remove
306	Manitoba Maple	*Acer negundo*	Native	1	17	2.0	High	Poor	Subject Property	Remove
307	Black Walnut	*Juglans nigra*	Native	1	11	2.0	Low	Good	Subject Property	Remove
310	White Elm	*Ulmus americana*	Native	2	10	4.0	High	Fair	Subject Property	Remove
311	White Elm	*Ulmus americana*	Native	1	16	1.5	Medium	Fair	Subject Property	Remove
312	White Elm	*Ulmus americana*	Native	1	33	4.0	High	Poor	Subject Property	Remove
313	White Elm	*Ulmus americana*	Native	1	25	3.5	Medium	Fair	Subject Property	Remove
314	Black Walnut	*Juglans nigra*	Native	1	10	3.0	Low	Good	Subject Property	Remove
315	Black Walnut	*Juglans nigra*	Native	1	14	3.0	Low	Good	Subject Property	Remove
316	Black Walnut	*Juglans nigra*	Native	1	14	3.0	Low	Good	Subject Property	Remove
317	White Elm	*Ulmus americana*	Native	1	19	2.5	Medium	Fair	Subject Property	Remove
318	Black Walnut	*Juglans nigra*	Native	1	49	6.0	Low	Good	Subject Property	Remove
319	White Elm	*Ulmus americana*	Native	1	15	3.0	High	Dead	Subject Property	Remove
320	Black Walnut	*Juglans nigra*	Native	1	62	7.0	Medium	Fair	Subject Property	Retain
321	White Elm	*Ulmus americana*	Native	1	13	3.0	Medium	Fair	Subject Property	Retain
322	White Elm	*Ulmus americana*	Native	1	12	3.0	High	Dead	Subject Property	Remove
323	White Elm	*Ulmus americana*	Native	1	31	3.0	High	Dead	Subject Property	Remove
324	Black Walnut	*Juglans nigra*	Native	1	15	2.5	Low	Good	Subject Property	Remove
325	Black Walnut	*Juglans nigra*	Native	1	11	2.0	High	Poor	Subject Property	Remove
326	White Elm	*Ulmus americana*	Native	1	18	3.0	Medium	Good	Subject Property	Remove
327	Black Walnut	*Juglans nigra*	Native	1	12	2.0	Medium	Fair	Subject Property	Remove
328	Black Walnut	*Juglans nigra*	Native	1	12	3.0	Medium	Fair	Subject Property	Remove
329	Black Walnut	*Juglans nigra*	Native	1	26	3.0	Medium	Fair	Subject Property	Retain
330	White Elm	*Ulmus americana*	Native	1	31	5.0	Medium	Fair	Subject Property	Remove
331	White Elm	*Ulmus americana*	Native	1	14	3.0	Medium	Fair	Subject Property	Remove
332	Hawthorn Species	*Crataegus sp.*	Native	1	14	2.0	High	Poor	Subject Property	Remove
333	White Elm	*Ulmus americana*	Native	1	10	2.0	Medium	Fair	Subject Property	Remove
334	Scots Pine	*Pinus sylvestris*	Non-Native	1	15	1.0	High	Poor	Subject Property	Remove
335	Black Walnut	*Juglans nigra*	Native	1	26	3.0	Medium	Fair	Subject Property	Remove
336	Eastern Red Cedar	*Juniperus virginiana*	Native	2	14	1.5	Medium	Fair	Subject Property	Remove
337	Black Walnut	*Juglans nigra*	Native	1	17	3.0	Medium	Fair	Subject Property	Remove
338	White Elm	*Ulmus americana*	Native	1	11	3.0	Medium	Fair	Subject Property	Remove
339	White Elm	*Ulmus americana*	Native	1	14	2.0	High	Dead	Subject Property	Remove
340	Black Walnut	*Juglans nigra*	Native	1	11	2.0	High	Poor	Subject Property	Remove
341	Black Cherry	*Prunus serotina*	Native	2	15	2.0	High	Poor	Subject Property	Retain
342	Manitoba Maple	*Acer negundo*	Native	1	36	6.0	High	Poor	Subject Property	Retain
343	Black Cherry	*Prunus serotina*	Native	1	37	6.0	High	Dead	Subject Property	Remove
344	Black Walnut	*Juglans nigra*	Native	1	11	2.0	High	Poor	Subject Property	Remove
345	White Elm	*Ulmus americana*	Native	1	12	2.0	High	Poor	Subject Property	Remove
346	Black Walnut	*Juglans nigra*	Native	1	12	1.0	High	Dead	Subject Property	Remove
347	Black Walnut	*Juglans nigra*	Native	1	17	3.0	High	Dead	Subject Property	Remove
348	Black Walnut	*Juglans nigra*	Native	1	11	2.0	Low	Fair	Subject Property	Remove
349	Common Apple	*Malus domestica*	Non-Native	2	10	4.0	High	Poor	Subject Property	Remove
350	Black Walnut	*Juglans nigra*	Native	1	12	3.0	Low	Good	Subject Property	Remove
351	White Elm	*Ulmus americana*	Native	1	23	5.0	High	Dead	Subject Property	Remove
352	Black Cherry	*Prunus serotina*	Native	2	13	4.0	Medium	Fair	Subject Property	Remove
353	Scots Pine	*Pinus sylvestris*	Non-Native	1	12	2.0	Low	Good	Subject Property	Remove
355	Hawthorn Species	*Crataegus sp.*	Native	2	12	3.0	High	Poor	Subject Property	Remove
356	White Elm	*Ulmus americana*	Native	1	22	4.0	High	Dead	Subject Property	Remove
357	White Elm	*Ulmus americana*	Native	1	27	4.0	Medium	Fair	Subject Property	Remove
358	Black Walnut	*Juglans nigra*	Native	1	12	3.0	Medium	Fair	Subject Property	Remove
359	White Elm	*Ulmus americana*	Native	1	16	4.0	Medium	Fair	Subject Property	Remove
361	Black Walnut	*Juglans nigra*	Native	1	39	5.0	High	Poor	Boundary	Remove
362	Black Walnut	*Juglans nigra*	Native	1	48	7.0	Medium	Fair	Subject Property	Remove
363	Black Walnut	*Juglans nigra*	Native	1	38	5.0	Medium	Fair	Boundary	Remove

1250 Gordon Street Tree Preservation Plan
Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action
364	Black Walnut	*Juglans nigra*	Native	1	39	6.0	Low	Good	Boundary	Remove
365	Black Cherry	*Prunus serotina*	Native	3	23	3.0	High	Very Poor	Boundary	Remove
366	White Elm	*Ulmus americana*	Native	1	10	2.0	Low	Good	Subject Property	Retain
367	White Elm	*Ulmus americana*	Native	1	26	5.0	High	Very Poor	Subject Property	Remove
368	White Elm	*Ulmus americana*	Native	1	13	3.0	Low	Good	Subject Property	Remove
369	White Elm	*Ulmus americana*	Native	1	15	3.0	High	Dead	Subject Property	Remove
370	Scots Pine	*Pinus sylvestris*	Non-Native	1	17	3.0	High	Dead	Subject Property	Remove
371	White Elm	*Ulmus americana*	Native	1	12	3.0	Medium	Fair	Subject Property	Retain
372	Butternut	*Juglans cinerea*	Native	1	17	3.0	Medium	Fair	Subject Property	Retain
373	Scots Pine	*Pinus sylvestris*	Non-Native	1	32	4.0	Low	Good	Subject Property	Remove
374	White Elm	*Ulmus americana*	Native	1	32	3.0	Medium	Fair	Subject Property	Retain
375	White Elm	*Ulmus americana*	Native	1	12	2.0	Low	Good	Subject Property	Retain
376	White Elm	*Ulmus americana*	Native	1	18	2.0	High	Poor	Subject Property	Remove
377	Scots Pine	*Pinus sylvestris*	Non-Native	3	31	4.0	High	Dead	Subject Property	Remove
378	White Elm	*Ulmus americana*	Native	1	12	1.0	High	Dead	Subject Property	Remove
379	White Elm	*Ulmus americana*	Native	1	19	4.5	Medium	Fair	Subject Property	Retain
380	White Elm	*Ulmus americana*	Native	1	16	3.0	Medium	Fair	Subject Property	Retain
381	White Elm	*Ulmus americana*	Native	1	26	4.5	Low	Good	Subject Property	Retain
382	White Elm	*Ulmus americana*	Native	1	19	4.0	Medium	Fair	Subject Property	Retain
383	White Elm	*Ulmus americana*	Native	1	25	4.0	Low	Good	Subject Property	Retain
384	White Elm	*Ulmus americana*	Native	1	30	4.0	Medium	Fair	Subject Property	Retain
385	Norway Spruce	*Picea abies*	Non-Native	1	28	4.0	Low	Good	Subject Property	Remove
386	Norway Spruce	*Picea abies*	Non-Native	1	78	4.0	Medium	Fair	Subject Property	Remove
387	Silver Maple	*Acer saccharinum*	Native	1	36	4.5	Medium	Fair	Subject Property	Remove
388	Eastern White Cedar	*Thuja occidentalis*	Native	5	22	2.0	Medium	Fair	Subject Property	Remove
389	Black Walnut	*Juglans nigra*	Native	1	10	3.0	Medium	Fair	Subject Property	Remove
390	Butternut	*Juglans cinerea*	Native	2	12	3.0	Medium	Fair	Subject Property	Remove
391	Norway Spruce	*Picea abies*	Non-Native	1	27	3.0	Medium	Fair	Subject Property	Remove
392	Norway Spruce	*Picea abies*	Non-Native	1	44	4.0	Medium	Fair	Subject Property	Remove
393	Norway Spruce	*Picea abies*	Non-Native	1	53	4.0	Medium	Fair	Subject Property	Remove
394	White Birch	*Betula papyrifera*	Native	2	19	3.0	Medium	Fair	Subject Property	Remove
395	Norway Spruce	*Picea abies*	Non-Native	1	31	3.0	Medium	Fair	Subject Property	Remove
396	Norway Spruce	*Picea abies*	Non-Native	1	19	2.0	Medium	Fair	Subject Property	Remove
397	Norway Spruce	*Picea abies*	Non-Native	1	24	2.5	Medium	Poor	Subject Property	Remove
398	Norway Spruce	*Picea abies*	Non-Native	1	21	2.5	Medium	Fair	Subject Property	Remove
399	Freeman's Maple	*Acer X freemanii*	Native	1	30	4.0	Medium	Fair	Subject Property	Remove
400	Freeman's Maple	*Acer X freemanii*	Native	1	38	7.0	Medium	Fair	Subject Property	Remove
410	Horsechestnut	*Aesculus hippocastanum*	Non-Native	1	14	1.5	Low	Good	Subject Property	Remove
411	Norway Maple	*Acer platanoides*	Non-Native	1	19	2.0	Medium	Fair	Subject Property	Remove
412	Common Apple	*Malus domestica*	Non-Native	3	34	4.0	Medium	Poor	Subject Property	Remove
413	Norway Maple	*Acer platanoides*	Non-Native	1	49	6.0	Medium	Fair	Subject Property	Remove
414	Eastern Cottonwood	*Populus deltoides*	Native	1	22	3.5	Low	Good	Subject Property	Remove
415	Eastern White Cedar	*Thuja occidentalis*	Native	1	14	1.0	Medium	Fair	Subject Property	Remove
416	Eastern White Cedar	*Thuja occidentalis*	Native	1	13	1.5	Medium	Fair	Subject Property	Remove
417	Eastern Cottonwood	*Populus deltoides*	Native	1	26	2.0	Low	Good	Subject Property	Remove
438	Norway Maple	*Acer platanoides*	Non-Native	1	50	5.0	Medium	Fair	Subject Property	Remove
439	Norway Maple	*Acer platanoides*	Non-Native	1	59	7.0	Medium	Fair	Subject Property	Remove
440	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	61	5.0	Medium	Fair	Subject Property	Remove
441	Freeman's Maple	*Acer X freemanii*	Native	1	37	5.0	Medium	Fair	Subject Property	Remove
442	Norway Spruce	*Picea abies*	Non-Native	1	39	5.0	Low	Fair	Subject Property	Remove
443	Norway Spruce	*Picea abies*	Non-Native	1	35	4.0	Medium	Fair	Subject Property	Remove
444	Norway Spruce	*Picea abies*	Non-Native	1	43	5.0	Low	Fair	Subject Property	Remove
445	Norway Spruce	*Picea abies*	Non-Native	1	29	4.0	Low	Good	Subject Property	Remove
446	Norway Spruce	*Picea abies*	Non-Native	1	28	4.0	Low	Good	Subject Property	Remove
447	Eastern White Cedar	*Thuja occidentalis*	Native	1	15	1.0	Medium	Fair	Subject Property	Remove
448	Eastern White Cedar	*Thuja occidentalis*	Native	1	20	1.0	Medium	Fair	Subject Property	Remove
449	Eastern White Cedar	*Thuja occidentalis*	Native	1	23	1.0	Medium	Fair	Subject Property	Remove
450	Norway Maple	*Acer platanoides*	Non-Native	1	56	6.0	Medium	Fair	Subject Property	Remove
451	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.0	Medium	Fair	Subject Property	Remove
452	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	47	5.0	Medium	Fair	Subject Property	Remove
453	White Birch	*Betula papyrifera*	Native	2	25	4.0	Medium	Fair	Subject Property	Remove
454	White Birch	*Betula papyrifera*	Native	1	27	5.0	Medium	Fair	Subject Property	Remove
455	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	38	5.0	Medium	Fair	Subject Property	Remove
456	Black Walnut	*Juglans nigra*	Native	1	11	3.0	Low	Fair	Subject Property	Remove
502	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
503	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
504	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
506	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
507	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
508	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
509	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
510	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
511	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
512	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
513	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
514	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
516	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
517	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
518	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
519	Norway Spruce	*Picea abies*	Non-Native	1		4.0	Low	Fair	Boundary	Retain
522	Trembling Aspen	*Populus tremuloides*	Native	1		4.0	Low	Fair	Subject Property	Remove
527	Eastern Red Cedar	*Juniperus virginiana*	Native	1	13	2.0	Low	Fair	Subject Property	Remove
551	Eastern White Cedar	*Thuja occidentalis*	Native	1	25	3.0	Low	Good	Subject Property	Remove
552	Trembling Aspen	*Populus tremuloides*	Native	1	23	4.5	Low	Good	Subject Property	Remove
582	Black Walnut	*Juglans nigra*	Native	1	13	3.0	Low	Fair	Subject Property	Remove
583	Black Walnut	*Juglans nigra*	Native	1	13	3.0	Low	Fair	Subject Property	Remove
584	Black Walnut	*Juglans nigra*	Native	1	13	2.5	Low	Fair	Subject Property	Remove

1250 Gordon Street Tree Preservation Plan

Tree Inventory Data

Tree Number	Common Name	Scientific Name	Native/ Non-native	Stem Count	DBH (cm)	Crown Radius (m)	Potential for Structural Failure Rating	Overall Condition	Location	Proposed Action
585	Eastern White Cedar	*Thuja occidentalis*	Native	1	12	2.0	Low	Fair	Subject Property	Remove
586	White Spruce	*Picea glauca*	Native	1	16	3.0	Low	Fair	Subject Property	Remove
587	White Spruce	*Picea glauca*	Native	1	15	3.0	Low	Fair	Subject Property	Remove
588	White Spruce	*Picea glauca*	Native	1	13	3.0	Low	Fair	Subject Property	Remove
589	Black Walnut	*Juglans nigra*	Native	1	11	2.0	Low	Fair	Subject Property	Remove
590	White Spruce	*Picea glauca*	Native	1	13	3.0	Low	Fair	Subject Property	Remove
591	White Spruce	*Picea glauca*	Native	1	20	3.0	Low	Fair	Subject Property	Remove
592	Black Walnut	*Juglans nigra*	Native	2	#VALUE!	3.5	Low	Fair	Subject Property	Remove
593	Black Walnut	*Juglans nigra*	Native	1	13	3.5	Low	Fair	Subject Property	Remove
594	Scots Pine	*Pinus sylvestris*	Non-Native	1	11	1.0	Medium	Fair	Subject Property	Retain
595	Black Walnut	*Juglans nigra*	Native	1	11	2.0	Low	Good	Subject Property	Remove
596	Weeping Birch	*Betula pendula*	Non-Native	1	10	2.0	Low	Good	Subject Property	Remove
597	Scots Pine	*Pinus sylvestris*	Non-Native	1	14	2.5	Low	Fair	Subject Property	Remove
599	Black Walnut	*Juglans nigra*	Native	1	18	3.0	Low	Good	Subject Property	Remove
600	Black Walnut	*Juglans nigra*	Native	1	11	2.0	Low	Good	Subject Property	Remove
601	Scots Pine	*Pinus sylvestris*	Non-Native	1	12	2.0	Low	Fair	Subject Property	Remove
602	Scots Pine	*Pinus sylvestris*	Non-Native	1	13	2.0	Low	Fair	Subject Property	Remove
603	Scots Pine	*Pinus sylvestris*	Non-Native	1	14	2.5	Low	Fair	Subject Property	Remove
613	Black Walnut	*Juglans nigra*	Native	1	16	3.0	Low	Fair	Subject Property	Remove
617	Scots Pine	*Pinus sylvestris*	Non-Native	1	11	2.5	Low	Good	Subject Property	Remove
619	Elm Species	*Ulmus sp.*	Native	1	10	2.0	Low	Good	Subject Property	Remove
620	Black Walnut	*Juglans nigra*	Native	1	10	3.0	Low	Good	Subject Property	Remove
622	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	2.0	Low	Good	Subject Property	Remove
624	Eastern White Cedar	*Thuja occidentalis*	Native	1	10	2.0	Low	Good	Subject Property	Remove
708	Black Walnut	*Juglans nigra*	Native	1	19	4.0	Low	Good	Subject Property	Remove
709	Norway Maple	*Acer platanoides*	Non-Native	1	16	4.0	Low	Fair	Subject Property	Remove
710	Black Walnut	*Juglans nigra*	Native	1	12		High	Dead	Boundary	Remove
712	Black Walnut	*Juglans nigra*	Native	1	14	4.0	Low	Good	Subject Property	Remove
713	Black Walnut	*Juglans nigra*	Native	1	13	3.5	Low	Good	Subject Property	Remove
714	Black Walnut	*Juglans nigra*	Native	1	12	2.5	Low	Good	Subject Property	Remove
715	Black Walnut	*Juglans nigra*	Native	1	12	2.0	Low	Good	Subject Property	Remove
915	Hawthorn Species	*Crataegus sp.*	Native	1	12	1.0	Medium	Poor	Subject Property	Remove
916	Butternut	*Juglans cinerea*	Native	1	17	1.0	Medium	Poor	Subject Property	Retain
917	Hawthorn Species	*Crataegus sp.*	Native	2	12	1.5	Medium	Poor	Subject Property	Retain
918	Butternut	*Juglans cinerea*	Native	1	13	1.0	Medium	Fair	Subject Property	Retain
919	Black Cherry	*Prunus serotina*	Native	7	18	2.0	Medium	Poor	Subject Property	Retain
943	Norway Spruce	*Picea abies*	Non-Native	1	16	2.5	Medium	Fair	Subject Property	Retain
944	Norway Spruce	*Picea abies*	Non-Native	1	15	2.0	Low	Fair	Subject Property	Retain
945	Norway Spruce	*Picea abies*	Non-Native	1	14	2.0	Low	Fair	Subject Property	Retain
989	Scots Pine	*Pinus sylvestris*	Non-Native	1	15	2.0	Low	Good	Subject Property	Retain
990	Scots Pine	*Pinus sylvestris*	Non-Native	1	13	2.0	Low	Good	Subject Property	Retain
1146	Scots Pine	*Pinus sylvestris*	Non-Native	1	16	2.0	Medium	Fair	Subject Property	Retain
1401	Eastern White Cedar	*Thuja occidentalis*	Native	1	19	3.0	Low	Good	Subject Property	Retain
1402	Scots Pine	*Pinus sylvestris*	Non-Native	1	15	2.0	Medium	Fair	Subject Property	Retain
1416	White Ash	*Fraxinus americana*	Native	1	20	2.5	High	Poor	Subject Property	Retain
1417	Black Walnut	*Juglans nigra*	Native	1	20	4.0	Medium	Fair	Subject Property	Retain
1418	Black Walnut	*Juglans nigra*	Native	1	19	3.0	Medium	Fair	Subject Property	Retain
1419	Black Walnut	*Juglans nigra*	Native	1	23	4.0	High	Poor	Subject Property	Retain
1420	Black Walnut	*Juglans nigra*	Native	1	31	5.0	Medium	Fair	Subject Property	Retain
1442	Black Walnut	*Juglans nigra*	Native	1	33	5.0	Medium	Poor	Subject Property	Retain
1443	Black Walnut	*Juglans nigra*	Native	1	36	5.0	Medium	Poor	Subject Property	Retain
1444	Black Walnut	*Juglans nigra*	Native	1	35	5.0	Medium	Poor	Subject Property	Retain
1455	Norway Spruce	*Picea abies*	Non-Native	1	36	1.0	Medium	Fair	Subject Property	Retain
1480	Norway Spruce	*Picea abies*	Non-Native	1	17		High	Dead	Subject Property	Retain
1481	Norway Spruce	*Picea abies*	Non-Native	1	21		High	Dead	Subject Property	Retain
1482	Norway Spruce	*Picea abies*	Non-Native	1	19	0.5	High	Very Poor	Subject Property	Retain
1552	Scots Pine	*Pinus sylvestris*	Non-Native	1	13		High	Dead	Subject Property	Retain
1553	Scots Pine	*Pinus sylvestris*	Non-Native	1	12	1.0	Medium	Fair	Subject Property	Retain
1555	Eastern White Cedar	*Thuja occidentalis*	Native	1	11	1.5	Low	Fair	Subject Property	Retain
1579	Scots Pine	*Pinus sylvestris*	Non-Native	1	11	1.0	High	Poor	Subject Property	Retain
1583	Scots Pine	*Pinus sylvestris*	Non-Native	1	13	1.0	Medium	Fair	Subject Property	Retain
1584	Scots Pine	*Pinus sylvestris*	Non-Native	1	12	1.0	Medium	Fair	Subject Property	Retain
A	Freeman's Maple	*Acer X freemanii*	Native	1	75	7.0	Medium	Fair	Subject Property	Remove
A	Eastern White Cedar	*Thuja occidentalis*	Native	1	16	1.0	Low	Fair	Subject Property	Remove
B	Eastern Cottonwood	*Populus deltoides*	Native	1	17	2.0	Low	Good	Subject Property	Remove
C	Black Walnut	*Juglans nigra*	Native	1	12	0.5	Low	Good	Subject Property	Retain
D	Butternut	*Juglans cinerea*	Native	1	20	4.0	Medium	Fair	Subject Property	Remove
E	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	30	3.0	Low	Good	Subject Property	Retain
F	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	45	4.0	High	Poor	Off-Property	Retain
G	Norway Spruce	*Picea abies*	Non-Native	1	45	5.0	Medium	Fair	Subject Property	Remove
I	Sugar Maple	*Acer saccharum ssp. saccharum*	Native	1	45	3.0	High	Poor	Subject Property	Retain
Polygon A	Norway Spruce	*Picea abies*	Non-Native	1	30	2.0	Low	Good	Subject Property	Remove
Polygon B	Eastern White Cedar	*Thuja occidentalis*	Native	1	16	1.0	Low	Fair	Subject Property	Remove
Polygon C	Eastern White Cedar	*Thuja occidentalis*	Native	1	18	2.0	Medium	Fair	Subject Property	Remove
Polygon D	Norway Spruce	*Picea abies*	Non-Native	5	34	4.0	Medium	Fair	Subject Property	Remove
Polygon E	Freeman's Maple	*Acer X freemanii*	Native	1	32	4.0	Medium	Fair	Subject Property	Remove
Polygon F	Norway Spruce	*Picea abies*	Non-Native	1	30	3.0	Low	Good	Subject Property	Remove

Appendix II

Tree Health and Potential for Structural Failure Assessment Criteria

Tree Health Assessment Criteria

Assessment Criteria	Definition[1]
Excellent	Represents a tree in near perfect form, health, and vigour. This tree would exhibit no deadwood, no decline, and no visible defects.
Good	Represents a tree ranging from a generally healthy tree to a near perfect tree in terms of health, vigour and structure. This tree exhibits a complete, balanced crown structure with little to no deadwood and minimal defects as well as a properly formed root flare.
Fair	Represents a tree with minor health, balance or structural issues with minimal to moderate deadwood. Branching structure shows signs of included bark or minor rot within the branch connections or trunk wood. The root flare shows minimal signs of mechanical injury, decay, poor callusing, or girdling roots. Trees in the category require minor remedial actions to improve the vigour and structure of the tree.
Poor	Represents a tree that exhibits a poor vigour, reduced crown size (<30% of crown typical of species caused by overcrowding or decline), extreme crown imbalance, or extensive rot in the branching and trunk wood. Fungus could be seen from these rotting areas, suggesting further decay. These trees have extensive crown die back with a large amount of deadwood, and possibly dead sections. These weakened areas can lead to a potential failure of tree sections. Rooting zones show signs of extensive root decay or damage (fruiting bodies or mechanical damage) or girdling roots. Trees in this category require more extensive actions to prevent failure. A tree identified as poor would be a candidate for removal in the near future.
Very Poor	Represents a tree that exhibits major health and structural defects. Quite often the defects or diseases affecting this tree will be fatal. Large quantities of fungus, large dead sections with possible cavities and bark falling off all are signs that a tree is in a major state of decline and would be identified as very poor. These trees have a probable or imminent potential for structural failure. These trees should be identified for removal.
Dead	Represents a tree that exhibits no sign of new growth, including buds, foliage, or shoot growth. These trees have a probable or imminent potential for structural failure. These trees should be identified for removal.

[1] (Dunster 2009)

Potential for Structural Failure Assessment Criteria

Assessment Criteria*	Definition[1]
Improbable	The tree or branch is not likely to fail during normal weather conditions and may not fail in many severe weather conditions within the specified time frame.
Possible	Failure could occur, but it is unlikely during normal weather conditions within the specified time frame.
Probable	Failure may be expected under normal weather conditions within the specified time frame.
Imminent	Failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load. This is a rare occurrence for an assessor to encounter, and it may require immediate action to protect people from harm.
*A specified time frame of 1 year will be used when assessing potential for structural failure.	

[1] (Dunster et al. 2013)

Appendix III
Conditions of Assessment

Conditions of Tree Assessment

Limitations

This tree inventory and assessment is based on the circumstances and observations by Natural Resource Solutions Inc. (NRSI) as they existed at the time of the site inspection(s) of the Client's Property as described in this report (the "Property") and the trees situated thereon, and upon information provided by the Client to NRSI. The opinions in this assessment are given based on observations made and using generally accepted professional judgment, however, because trees are living organisms and subject to change, damage and disease, the results, observations, recommendations, and analysis as set out in this assessment are valid only at the date any such observations and analysis took place. No guarantee, warranty, representation or opinion is offered or made by NRSI as to the length of the validity of the results, observations, recommendations and analysis contained within this assessment. As a result, the Client shall not rely upon this assessment, save and except for representing the circumstances and observations at the date of site inspection(s), and the analysis and recommendations made in relation to the proposed undertaking. It is recommended that the inventoried trees discussed in this assessment should be re-assessed periodically, where required.

Further Services

Neither NRSI, nor any assessor employed or retained by NRSI (the "Assessor") for the purpose of preparing or assisting in the preparation of this assessment shall be required to provide any further consultation or services to the Client including, without limitation, acting as an expert witness or witness in any court in any jurisdiction unless the Client has first made specific arrangements with respect to such further services, including providing payment of the Assessor's regular hourly billing fees.

NRSI accepts no responsibility for the implementation of all or any part of this report, unless specifically requested to examine the implementation of such activities recommended herein. Any request for the inspection or supervision of all or part of the implementation shall be made in writing and the details agreed to in writing by both parties.

Assumptions

The Client is hereby notified that where any of the information set out and referenced in this assessment are based on assumptions, facts or information provided to NRSI, NRSI will in no way be responsible for the veracity or accuracy of any such information. Further, the Client acknowledges and agrees that NRSI has, for the purposes of preparing their assessment, assumed that the Property is in full compliance with all applicable federal, provincial, municipal and local statutes, regulations, by-laws, guidelines and other related laws. NRSI explicitly denies any legal liability for any and all issues with respect to non-compliance with any of the above-referenced statutes, regulations, by-laws, guidelines and laws as it may pertain to or affect the Property.

Restriction of Assessment

The assessment carried out was restricted to the areas as described in this report. NRSI is not legally liable for any other trees except those expressly discussed herein. The conclusions of this assessment do not apply to any areas, trees, or any other property not covered or referenced in this assessment.

Professional Responsibility

In carrying out this assessment, NRSI and any Assessor appointed for and on behalf of NRSI to perform and carry out the assessment has exercised a reasonable standard of care, skill and diligence. The assessment has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discolored foliage (during the leaf-on period), the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the assessment, none of the trees examined on the property were dissected, cored, probed, or climbed, and detailed root crown examinations involving excavation were not undertaken.

No guarantees are offered, or implied, that trees recommended for retention, or all parts of them, will remain standing. It is professionally impossible to predict with absolute certainty the behaviour of any single tree or group of trees, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential to fall, lean, or otherwise pose a danger to property and persons in the event of extreme weather conditions, and this risk can only be eliminated if the tree is removed.

Without limiting the foregoing, no liability is assumed by NRSI or its directors, officers, employers, contractors, agents or Assessors for:

a) any legal description provided with respect to the Property;
b) issues of title and/or ownership with respect to the Property;
c) the accuracy of the Property line locations or boundaries with respect to the Property; and
d) the accuracy of any other information provided to NRSI by the Client or third parties;
e) any consequential loss, injury or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings and business interruption; and
f) the unauthorized distribution of the assessment.

Third Party Liability

This assessment was prepared by NRSI for the Client. The data collected reflect NRSI's best assessment of the inventoried trees situated on the Property with the information available at the time of observation. Data analysis and the assessment of potential impacts to inventoried trees is specific to the proposed undertaking as described in this report. NRSI accepts no responsibility for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use of this assessment for purposes unrelated to the proposed undertaking.

General

Any plans and/or illustrations in this assessment are included only to help the Client visualize the issues in this assessment and shall not be relied upon for any other purpose.

This report shall be considered as a whole, no sections are severable, and the assessment shall be considered incomplete if any pages are missing.

Appendix IV
Tree Data and Summary Tables

Tree Inventory Data Summarized by Species

Common Name	Scientific Name	Excellent	Good	Fair	Poor	Very Poor	Dead	Grand Total
Native		**1**	**47**	**355**	**53**	**3**	**16**	**475**
American Basswood	*Tilia americana*			2				2
Balsam Fir	*Abies balsamea*		1					1
Black Cherry	*Prunus serotina*			1	2	1	1	5
Black Maple	*Acer saccharum ssp. nigrum*				5			5
Black Walnut	*Juglans nigra*		19	26	9		3	57
Butternut	*Juglans cinerea*			5	1			6
Eastern Cottonwood	*Populus deltoides*		3					3
Eastern Red Cedar	*Juniperus virginiana*			2				2
Eastern White Cedar	*Thuja occidentalis*		7	248	19		2	276
Elm Species	*Ulmus sp.*		1					1
Freeman's Maple	*Acer X freemanii*			15				15
Green Ash	*Fraxinus pennsylvanica*		2	1	1			4
Hawthorn species	*Crataegus sp.*			2	4			6
Honey Locust	*Gleditsia triacanthos*			3				3
Manitoba Maple	*Acer negundo*			1	3			4
Red Maple	*Acer rubrum*						1	1
Red Oak	*Quercus rubra*		1	8		1		10
Silver Maple	*Acer saccharinum*			1				1
Sugar Maple	*Acer saccharum ssp. saccharum*		2	11	4			17
Tamarack	*Larix laricina*			1				1
Trembling Aspen	*Populus tremuloides*		1	1				2
White Ash	*Fraxinus americana*		1		1			2
White Birch	*Betula papyrifera*			3				3
White Elm	*Ulmus americana*		8	17	4	1	9	39
White Spruce	*Picea glauca*	1	1	7				9
Non-Native		**5**	**89**	**100**	**26**	**2**	**10**	**232**
Colorado Spruce	*Picea pungens*	1					1	2
Common Apple	*Malus domestica*			2	6			8
Common Pear	*Pyrus communis*				3	1		4

Common Name	Scientific Name	Excellent	Good	Fair	Poor	Very Poor	Dead	Grand Total
Crack Willow	*Salix fragilis*				1			1
European Weeping Birch	*Betula pendula*			1				1
Fir species	*Abies sp.*			1				1
Horsechestnut	*Aesculus hippocastanum*		1					1
Linden	*Tilia sp.*			5				5
Norway Maple	*Acer platanoides*			10	2			12
Norway Spruce	*Picea abies*	4	71	62	10	1	6	154
Pine Species	*Pinus sp.*			1				1
Scots Pine	*Pinus sylvestris*		16	17	4		3	40
Siberian Elm	*Ulmus pumila*			1				1
Weeping Birch	*Betula sp.*		1					1
Grand Total		**6**	**136**	**455**	**79**	**5**	**26**	**707**

Summary of Health and Risk Assessment

Potential for Structural Failure Rating	**Overall Condition**						Total
	Excellent	Good	Fair	Poor	Very Poor	Dead	
Low	6	134	255				395
Medium		2	198	18			218
High			2	61	5	26	94
Total	6	136	455	79	5	26	707

Maps

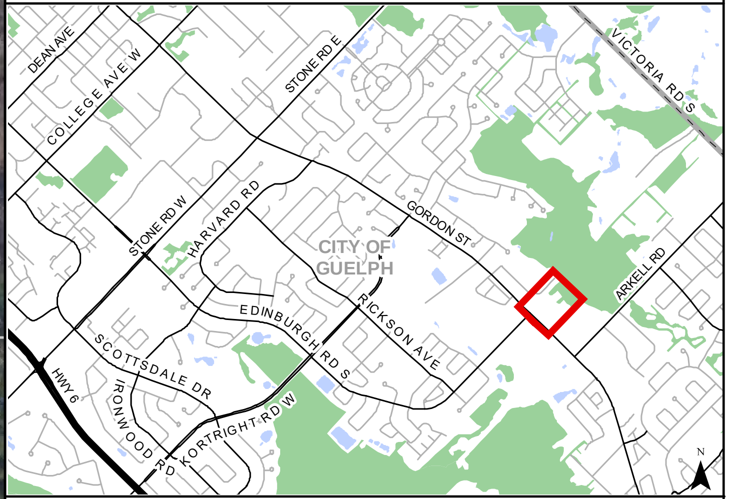
Map 1. Study Area and Natural Features

Map 2. Tree Inventory and Protection Plan

Map 1

1250 Gordon Street

Subject Property



Legend

- 🟧 Subject Property
- ☐ Parcel Boundary
- ― Significant Woodland Boundary - City of Guelph (October 2014 and July 2017)
- - - Significant Woodland 10m Setback
- 🟩 Provincially Significant Wetland (PSW)

Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists

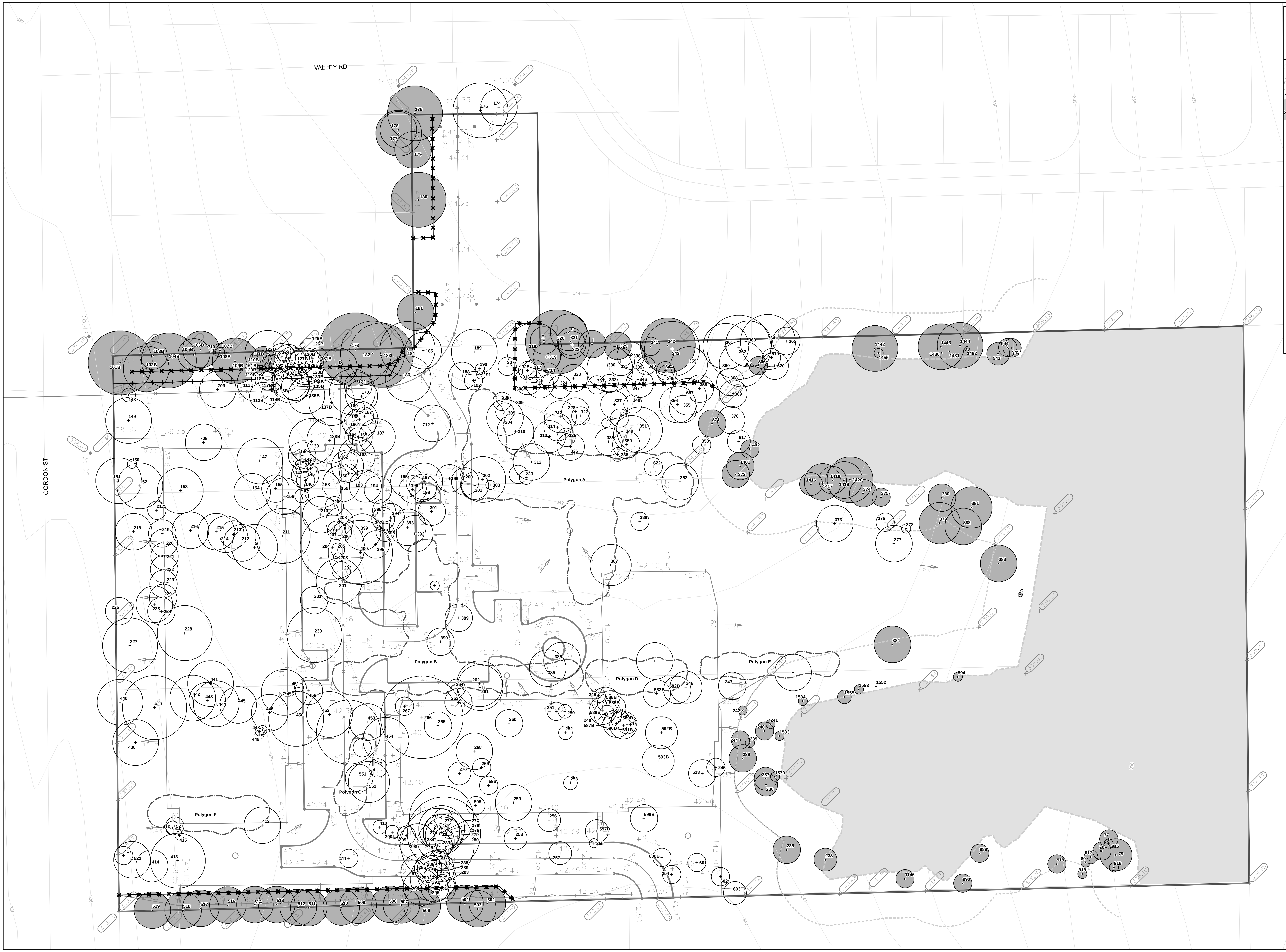
Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNRF© Copyright: Queen's Printer Ontario. Imagery: First Base Solutions (2019).

Project: 2347 Date: March 18, 2020	NAD83 - UTM Zone 17 Size: 11x17" **1:1,000**

0 20 40 60 Metres

N

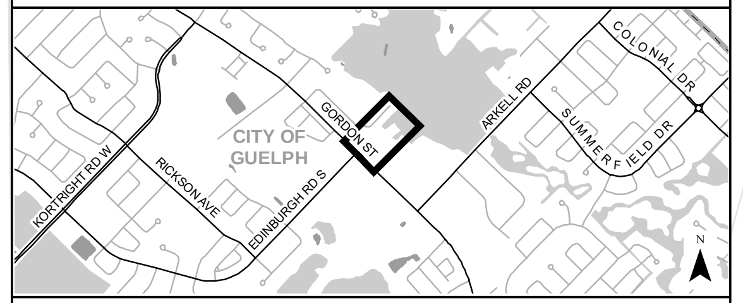
Path: X:\2347_TricarGordonStreet\NRSI_2347_Map1_SubjectProperty_1K_2020_03_18_KEF.mxd



Map 2

1250 Gordon Street

Tree Inventory and Preservation Plan



Legend

▬	Subject Property
▨	Significant Woodland (To be Retained)
‒ ‒	Significant Woodland Boundary - City of Guelph (October 2014 and July 2017)
- - -	Significant Woodland 10m Setback
—	Site Plan
—	Existing Conditions
✕—	Tree Protection Fencing
⊙	Inventoried Tree to be Retained (Crown to Scale)
⊡	Retain & Prune
⊗	Inventoried Tree to be Removed (Crown to Scale)
⌜⌟	Hedgerow to be Removed

Natural Resource Solutions Inc.
Aquatic, Terrestrial and Wetland Biologists

Project: 2347
Date: March 27, 2020

NAD83 - UTM Zone 17
Size: 24x36"
1:350

0 5 10 15 20 Meters

APPENDIX G
FUNCTIONAL SERVICING REPORT

Functional Servicing Report for Gordon Street – Guelph ON

April 13, 2020

Prepared for:

Tricar Developments Inc.

Prepared by:

Stantec Consulting Ltd.
600-171 Queens Avenue
London ON N6A 5J7

This document entitled Functional Servicing Report for Gordon Street – Guelph ON was prepared by Stantec Architecture Ltd. ("Stantec") for the account of Tricar Development Inc. (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by ______ __________

Derrick Rice, EIT

Reviewed by _______ ______

Jen Young, P.Eng.

Approved by ______________________________________

(signature)

Chris Hendriksen, P.Eng.

Table of Contents

LIST OF TABLES

APPENDICES

PRELIMINARY CIVIL DRAWING PACKAGE

FIGURE 1 – EXISTING STORM DRAINAGE CONDITIONS

PROPOSED STORM DRAINAGE CONDITIONS

HYDROLOGIC MODELLING PARAMETERS

MIDUSS MODELING FILES

ROCK TRENCH SIZING CALCULATIONS

STORMCEPTOR SIZING REPORT

1.0 INTRODUCTION AND BACKGROUND

1.1 OVERVIEW

This Functional Servicing Report has been prepared in support of the Zoning and Official Plan amendment and the Site Plan Application for the proposed development located at 1242, 1250 & 1260 Gordon Street (Site) in the City of Guelph (City). The subject property is approximately 2.8 ha in size and is bounded to the northwest by existing residential subdivision, to the northeast by protected woodlot, to the southwest by Gordon Street, and to the southeast existing high-density development.

The conceptual site plan for the proposed development that forms the basis of this servicing assessment includes two 12 story apartment buildings consisting of 9 townhouse units and 368 apartment units. The bulk of site parking will be achieved through underground and at/above grade enclosed parking.

This report outlines how the proposed development can be supplied with adequate services, including sanitary, domestic water, storm drainage and includes the preliminary design of the infiltration and water quality facilities proposed to provide the required water quality and quantity controls and the preliminary erosion and sediment control strategy to be implemented during construction.

1.2 BACKGROUND INFORMATION

A variety of sources have been referenced during the preparation of this report, and the following should be read in conjunction with this Report:

- Geotechnical Engineering Report, Two 12-Storey Apartment Buildings 1242, 1250, 1260 Gordon Street, Guelph, Ontario (CMT Engineering Inc, April 2018)
- Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation Authority and Toronto and Region Conservation Authority, 2010)
- Erosion & Sediment Control Guideline for Urban Construction, (Greater Golden Horseshoe Area Conservation Authorities, December 2006)
- Stormwater Management Planning and Design Manual (SWMPD Manual), (Ontario Ministry of the Environment, March 2003)
- Development Engineering Manual, City of Guelph (City of Guelph Engineering and Transportation Services, January 2019)
- Groundwater Flow, Figure 14 of 1242, 1250, 1260 Gordon Street and 9 Valley Road Hydrogeological Assessment (Stantec Consulting Ltd., March 2020)
- Hanlon Creek Watershed Plan (Marshal Macklin Monaghan Ltd., LGL Ltd., October 1993)

- Torrance Creek Subwatershed Study- Management Strategy (Totten Sims Hubicki Associates, et al, September 1998)

1.3 EXISTING INFRASTRUCTURE

A summary of the municipal infrastructure that currently exists near the Site is as follows:

- A 200mm sanitary sewer located on Gordon Street.
- A 400mm watermain on Gordon Street.
- A 575mm storm sewer on Gordon Street.

Fully constructed municipal roads include Gordon Street to the west and Valley Road to the north.

2.0 OVERALL GRADING AND DRAINAGE

2.1 DESIGN CONSTRAINTS AND PROCEDURES

Using existing topographic information provided by BSR&D limited (dated November 2014), the proposed Site grading will be designed to generally meet the following criteria:

- Match existing grades at all site boundaries.
- Match existing grades at existing tree driplines wherever possible to facilitate tree retention.
- Extension of Edinburgh Road and Valley Road to municipal standards and match into existing road grades of Gordon Street and Valley Road.
- Account for future urbanization of adjacent lands.
- Have consideration for future pedestrian connections north of the site towards Valley Road.
- Provide adequate cover over underground services.
- Ensure all building openings are protected from flooding.
- Comply with Municipal standards for minimum and maximum grades.
- Provide major overland flow routes for flows exceeding the storm sewer capacity.
- Maintain drainage from Gordon Street right-of-way and neighboring properties to the north and south.

2.2 PROPOSED ROAD PROFILES AND OVERALL SITE GRADING

Road profiles within the subject site were established based on the proposed street pattern to satisfy the constraints outlined in the previous Section 2.1. The road profiles have been designed to accommodate the constraints set out by the site layout and underground parking limits with grades ranging from 0.5% to 8.0% with 3:1 and 4:1 transition slopes or retaining walls utilized to accommodate the various grade changes within the site and at various perimeter locations. The proposed centerline road elevations for the extension Landsdown Drive and Edinburgh Road and lot grades are illustrated on the Grading plan as well as the plan and profile provided for these extensions (Drawing No. 4 of 7 and 5 of 7) included in Appendix A. Existing grades and cross sections of Gordon Street and Valley Road have been considered fixed constraints in the development of the preliminary grading. The extension of Landsdown Drive and Edinburgh Road will be 8.4m back of curb to back of curb as per City of Guelph's Linear Infrastructure Standard drawing SD-48a. Internal roads, consisting of 6.7m wide asphalt as the building has structured parking not subject to the standard 7.0m minimum width drive aisle.

3.0 SANITARY SERVICING

The City of Guelph is currently completing the Gordon Street Improvements EA and an overall Master Wastewater Servicing Plan that is considering an upgrade to the sanitary service capacity within Gordon Street fronting the site. Through correspondence with the City in 2019 and 2020, the proposed development will be incorporated in the design of the sanitary sewer upgrades. Confirmation of this has been received from Daryush Esmaili via email received June 28, 2019 and Reg Russwurm via email received March 4, 2020 (see email correspondence attached).

A 200mm extension of the municipal sanitary sewer east on the Edinburgh Road extension proposed as part of this redevelopment to provide service to the site. Sewers will be designed in accordance with the requirements of the Ontario Building Code and the City of Guelph. An illustration of the sanitary sewer layout can be found in the Sanitary Area Plan (Sheet No. 3 of 7) included in Appendix A.

4.0 WATER DISTRIBUTION

The existing water distribution system near the Site includes a 400mm watermain on Gordon Street. The primary source for the proposed development will be the Gordon Street watermain. It is anticipated that the following work to the existing municipal infrastructure will be made:

- Tapping sleeve and valve connection to the 400mm Gordon Street watermain (200mm connection).
- Extension of the municipal watermain along the Edinburgh Road extension to provide service to the Site.

Please refer to the Preliminary Servicing plan (Drawing No. 1 of 7) for an illustration of the watermain layout.

Based on building information currently available, a conservative fire flow requirement for the site is 150 L/s, based on typical OBC calculations as provided in Appendix B.

A 200 mm diameter watermain is proposed for the development with 200mm connections provided to each building. They are positioned as illustrated on the Preliminary Servicing plan (Drawing No. 1 of 7).

Fire protection will be provided via onsite hydrants, adequately spaced to ensure proper coverage to all buildings, in conjunction with standpipe connections for building sprinkler systems. The City of Guelph will confirm the pipe sizing proposed provides adequate pressure to meet MOE design criteria. No backflow prevention or pressure reducing valves (PRV) have been proposed for this development.

5.0 STORMWATER MANAGEMENT STRATEGY

5.1 STORMWATER MANAGEMENT CRITERIA

This site is covered by criteria from different documents. The documents and site criteria are discussed below.

5.1.1 HANLON CREEK WATERSHED PLAN (HCWP)

The HCWP states that for upper Hanlon Creek development no urban drainage will be permitted to the headwaters of Tributary E or F, except for lands that already have drainage outlets. All stormwater generated from the area must either infiltrate into the ground or evaporate (100-year infiltration and zero runoff). There is no discussion in the report on requirements for redeveloping lands within the existing development areas where this project is located.

5.1.2 TORRANCE CREEK SUBWATERSHED STUDY (TCSS)

The TCSS states that for Zone 2, where this site is located, the requirement is to detain the post-development flow to pre-development ratees for the 2- to 100-year events and to infiltrate 150 mm/yr.

5.1.3 CITY OF GUELPH DEVELOPMENT ENGINEERING MANUAL

The specific SWM Criteria for the Site from the City of Guelph Development Engineering Manual (January 2019).

Water Quantity Control

- Based on City Guidelines, on-site stormwater control should be sized to attenuate post-development peaks flows to the pre-development (existing) peak flows. This ‘post-to-pre’ control should be provided for the 2-year through to the 100-year storm events.

Water Quality Control

- Based on City guidelines, the feasibility of on-site infiltration should be investigated. All developments are required to provide a minimum of Enhanced water quality level protection (ie, 80% TSS removal). It is recommended for small development sites (approximately 2 ha) a treatment train approach be followed.

5.1.4 Criteria for the Site

The HCWP appears to be more applicable to development in the upper Hanlon Creek areas, with drainage to Tributaries E and F. The project site is located in the ‘existing development’ area within the study and is not specifically addressed within the plan and drains to Tributary D.

Additionally, the GRCA mapping for the site shows a recharge of 122-199 mm/year and runoff of 118-207 mm/year while sites within the Upper Hanlon Creek area have a recharge of 315-371 mm/year and a runoff of 0 mm/year, showing that the flow regime for the two areas is obviously different.

Based on the above information, it was decided that applying the TCSS criteria to the site was a reasonable approach based on the information available. The SWM criteria for the site are as follows:

- Attenuate post-development peak flows to pre-development rates for the 2-year though 100-year storm events
- Infiltrate, evaporate, or reuse 150 mm/yr
- Minimum of Enhanced Water Quality Protection.

5.2 SOILS INFORMATION

Site soil properties were confirmed using the Geotechnical Investigation Report (XCG Consulting Ltd., April 2018), which outlined soil conditions for the site as per tested boreholes. It was confirmed that site soils can be expected to be sand – silt with traces of clay, with overall good drainage properties. For this analysis, site soils were classified as BC, which was deemed to be a conservative estimate. Infiltration rates for the site were determined to be approximately 7 mm/hr.

A hydrogeologic assessment was completed by Stantec Consulting for the site. In the Site monitoring well MW5 – 18S a high water table elevation of 340.3 m was recorded. For the purposes of this design, this value was taken to represent the high groundwater elevation for the Site. The groundwater flow follows a similar divide as surface water, with a portion flowing east as part of the Torrance Creek Watershed, and another portion flowing west as part of the Hanlon Creek Watershed.

5.3 HYDROLIC MODELING

A hydrologic model was prepared to simulate drainage conditions for the subject development. MIDUSS was used to predict flows for the existing and proposed development conditions and to design the SWM system to ensure the previously mentioned criteria were achieved.

To address the criteria, existing and post-development conditions were modeled for the 2 year through to the 100-year, 3-hour Chicago design storms, derived using the City of Guelph parameters as provided in Table 1.

Table 5.1 City of Guelph – Chicago Storm Parameters

Storm Event	a	b	c	Duration (hrs.)	Depth (mm)
2-year	743	6	0.798	3	34
5-year	1593	11	0.879		47
10-year	2221	12	0.908		56
25-year	3158	15	0.936		68
50-year	3886	16	0.950		78
100-year	4688	17	0.925		87

5.4 EXISTING CONDITIONS

The existing site is 2.86 ha in area and includes 3 residential properties with gravel/asphalt driveways. A large portion of the site is a woodlot area, and part of the Torrance Watershed, and generally has fairly steep slopes (approximately 5.0 %). A portion of the properties drain to an existing storm sewer on Gordon Street. The drainage catchments are shown on Figure 1, attached, and are summarized below.

- **Catchment 101** – A 1.13 ha area that includes residential homes, with storm water out-letting to Gordon Street to the west.
- **Catchment 102** – A 1.73 ha undeveloped area, which discharges as shallow overland flow to the woodlot to the east, part of the Torrance Creek Swamp

Detailed modeling calculations have been appended for reference and show results for the 2 through to the 100-year event. Proposed Conditions

The proposed site plan includes two 12-storey apartment buildings, one with one level of underground parking and one with one level of underground parking. The proposed drainage catchments are summarized in detail below and shown in Figure 2, attached. Generally, the proposed conditions will increase the area out-letting to Gordon Street to the west and will reduce the area out-letting to the woodlot to the east. The development will also increase the impervious area and will produce an increase in stormwater flows to the downstream Gordon Street storm sewer.

- **Catchment 201** – A 0.12 ha building/landscaped area that will drain uncontrolled to Gordon Street to the west.
- **Catchment 202** – A 0.21 ha roof top area. Runoff from this area will be attenuated by a roof-top control system system, and ultimately outlet to the downstream Gordon Street storm sewer. The 25 mm rainfall event will be directed to a rock (infiltration) trench, situated east of the developed area.

- **Catchment 203** – A 0.23 ha rooftop area. Runoff from this area will be attenuated by a roof-top control system and ultimately outlet to the downstream Gordon Street storm sewer. The 25 mm rainfall event will be directed to a rock (infiltration) trench, situated east of the developed area.
- **Catchment 204** – A 0.85 ha area, including the parking area, lane-way and small portions of landscape. Runoff from the impervious area will be collected by catchbasins and conveyed via a storm sewer system to an underground storage tank. This tank will be located in the parking lot structure at the north end of the site and will attenuate flows to pre-development levels prior to out-letting to the downstream Gordon Street storm sewer. A Manhole upstream of this tank will outlet the first 25 mm of every rain event to the east rock trench.
- **Catchment 205** – A 1.44 ha woodlot area draining uncontrolled east to the Torrance watershed

5.5 WATER QUANTITY CONTROL

Stormwater runoff will be provided with water quantity control by a combination of rooftop controls over both the west and east building and a subsurface storage tank located in the underground parking structure at the north section of the development.

The rooftop controls will provide flow attenuation to both building areas, Catchment 202 and Catchment 203. The rooftop controls will allow for 16.0 cm of ponding, and through a 75 mm diameter orifice will direct attenuated flows into a downspout system. The rooftop downspouts will connect into an on-site infiltration (rock) trench in Catchment 205. This feature will promote infiltration of the rooftop runoff to the groundwater system, with overflows backing up to a subsurface storage tank and ultimately out-letting to the Gordon Street storm sewer.

A storm sewer system will convey collected runoff from Catchment 204 to the subsurface tank. A 75 mm orifice control will be provided on the downstream end, prior to discharge to the Gordon Street storm sewer. The first 25 mm event will be directed to the infiltration trench through an orifice control. This subsurface tank was sized to provide flow attenuation to Catchment 204, such that the total flow to Gordon Street (inclusive of rooftop-controlled flow from Catchment 203 and 204) meets the pre-development target rates. Table 2 below shows the existing and controlled post-development flow rates. As shown, the pre-development targets are met for the two site outlets in the post-development condition.

Table 5.2 Pre-Development and Post-Development Flow Rates

Storm Event	**Existing Flow Rates to Outlet (m^3/s)**	
	Gordon Street (101)	**Torrance Creek Watershed (102)**
2-yr	0.008	0.003
5-yr	0.013	0.006
100-yr	0.034	0.040
Storm Event	**Proposed Flow Rates to Outlet (m^3/s)**	
	Gordon Street (201, 202, 203, 204)	**Torrance Creek Watershed (205)**
2-yr	0.007	0.003
5-yr	0.013	0.005
100-yr	0.033	0.036

The subsurface tank has been sized to provide an active storage volume such that the required flow attenuation is provided. During the 100-year event a total of 420 m3 of active storage will be utilized in the subsurface storage tank, 121 m3 of active storage will be provided on the West Building rooftop (Catchment 202) and 143 m3 of active storage will be provided on the East Building rooftop (Catchment 203).

Subsurface storage, rooftop controls, parking lot ponding configurations will be confirmed at detailed design, based on final site plan layout, grading and servicing.

It is noted that under proposed conditions less runoff will outlet to the Torrance Watershed, as the contributing drainage catchment has been reduced (1.44 ha in proposed vs. 1.73 ha in existing). This will cause a small decrease in surface and groundwater flows to Torrance Creek. However, the infiltration trench (downstream of Catchment 202, 203 and 204) is located within the Torrance Watershed and will increase the infiltration to Torrance Creek to help offset the reduction in area by providing more groundwater flow.

It is expected that the reduction in flows from existing to proposed conditions for the Torrance Watershed will be less than 10% for both minor and major storm events. Considering the entire Torrance Watershed catchment, this reduction in flows is negligible. It is not expected that this flow decrease will adversely impact the downstream watershed.

For more details of the stormwater management strategy, including model parameters and inputs/outputs data files, please see the attachments.

5.6 ON-SITE INFILTRATION

An on-site infiltration (rock) trench was sized to capture and infiltrate the 25 mm event over Catchment 202 (West Building roof area), Catchment 203 (East Building roof area) and Catchment 204 (parking area). The total controlled area is 4,400 m^2 of rooftop and 8,500 m^2 or parking lot. The total infiltration volume is 323 m^3 of stormwater runoff.

This infiltration trench will be located along the east portion of the development, in Catchment 205. By infiltrating the first 25 mm of every storm event, it is expected 80% TSS removal (enhanced level protection) will be provided to the off-site runoff, in accordance with City of Guelph standards. The trench was sized to draw-down within 48 hours after roof-top ponding.

The infiltration trench consists of the following components:

- Surface area of 672 sq*m;
- Assumed subsurface soil infiltration rate of 7 mm/hr - which was deemed to be a conservative estimate;
- Infiltration gallery 0.96 m deep (filled with clearstone) with sides wrapped in filter fabric.

The invert of the infiltration gallery is 339.00 m, and therefore the high groundwater elevation of 340.3 m will intercept the gallery during seasonal high groundwater levels. However, it should be noted that the 340.3 m groundwater elevation is the highest groundwater level observed on site at MW5-18(S), and other monitoring wells recorded lower groundwater elevations. The high groundwater elevations on-site generally ranged from 340.0 to 334.0 m across 5 monitoring wells.

The groundwater elevations were recorded in on-site monitoring well MW5-18(S) by Stantec from approximately September 2018 to January 2020. During this 16-month period, the high groundwater elevation exceeded 339.00 m from approximately beginning of April through to the end of June 2019 (a 3-month period). During other times the high groundwater table was consistently below 339.00 m. The infiltration gallery should only be intercepted by groundwater in spring-time. The groundwater level is below the invert of the rock trench, notably during summer periods when urban catchments would experience increased runoff from summer storms. In the event that the infiltration gallery is submerged, water will back up into the parking lot underground storage tank and ultimately outlet to the Gordon Street storm sewer.

Prior to the installation of the infiltration trench, the on-site infiltration rate should be confirmed via in-situ testing and deemed to be acceptable by the design engineer. For more details of the on-site infiltration trench, please see the attached calculation sheet.

5.7 WATER QUALITY CONTROL

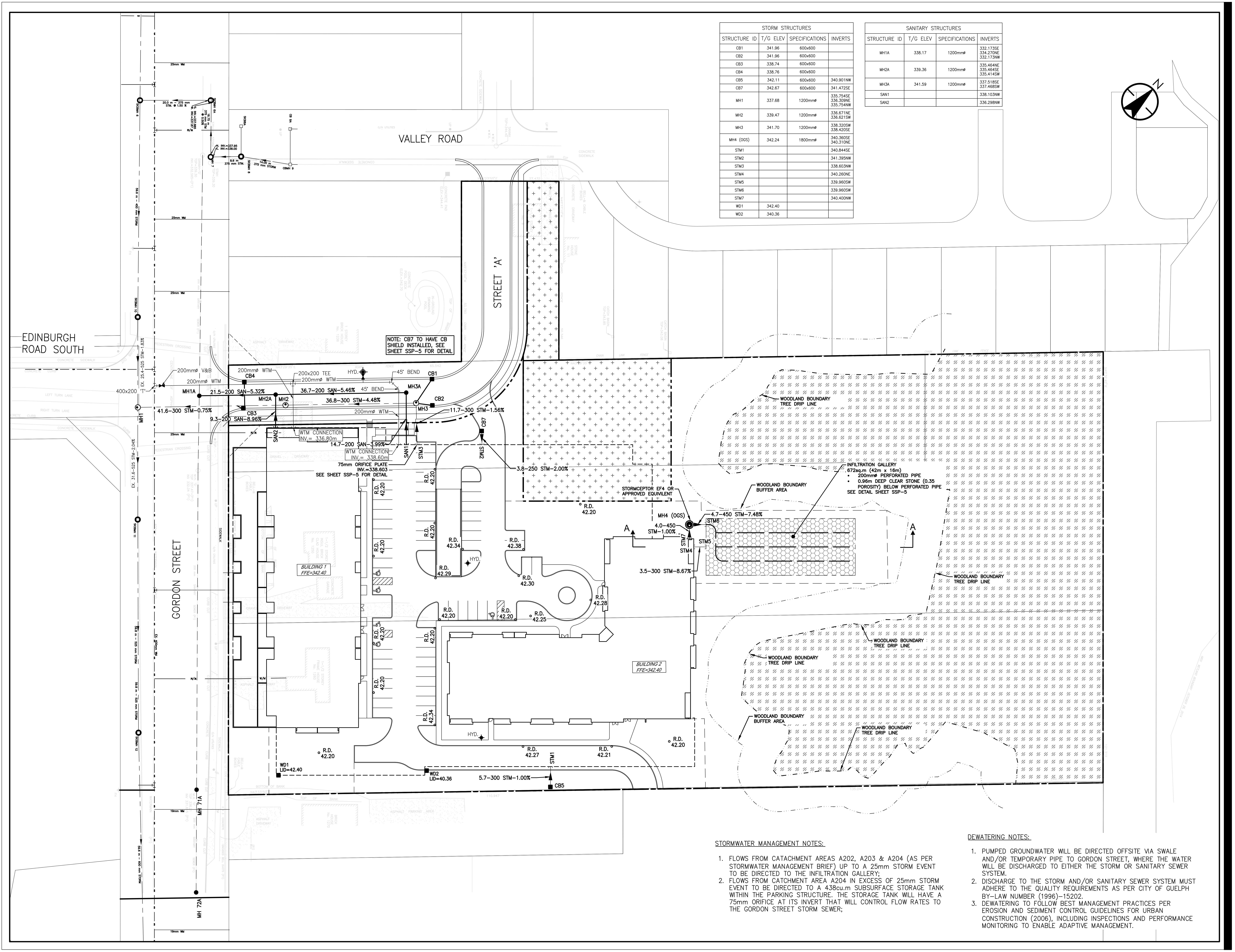
To comply with the City of Guelph ‘treatment train’ recommendation, an Oil-Grit Separator Unit (Stormceptor EF4) was sized upstream of the underground storage tank. In addition, catchbasin shields will be provided on-site. As the Stormceptor EF 4 will provide approximately 90% TSS removal to runoff from Catchment 204 this approach will incorporate redundancy into the water quality system and it can be expected that the entire site (including uncontrolled Catchment 201) will have approximately 80% TSS removal. For a detailed sizing report of the Stormceptor EF4, please see the attachment.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding report, the following conclusions can be drawn:

- Sanitary service is provided by the proposed upgrade to the municipal system located on Gordon Street just west of the site access.
- Water service is provided from the existing 400mm watermain on Gordon Street fronting this site.
- Enhanced (Level 1) water quality control will be provided for the site by a combination of OGS unit, and infiltration gallery. Adequate water quality volumes will be provided to meet the MOE water quality requirements associated with infiltration facilities.
- The proposed infiltration will infiltrate the 25 mm event to maintain predevelopment conditions
- The proposed rooftop storage and detention tank will detain the 2- to 100-year peak flows to predevelopment levels prior to discharge to Gordon Street.

PRELIMINARY CIVIL DRAWING PACKAGE



STORM STRUCTURES			
STRUCTURE ID	T/G ELEV	SPECIFICATIONS	INVERTS
CB1	341.96	600x600	
CB2	341.96	600x600	
CB3	338.74	600x600	
CB4	338.76	600x600	
CB5	342.11	600x600	340.901NW
CB7	342.67	600x600	341.472SE
MH1	337.68	1200mmø	335.754SE 336.309NE 335.754NW
MH2	339.47	1200mmø	336.671NE 336.621SW
MH3	341.70	1200mmø	338.320SW 338.420SE
MH4 (OGS)	342.24	1800mmø	340.360SE 340.310NE
STM1			340.844SE
STM2			341.395NW
STM3			338.603NW
STM4			340.260NE
STM5			339.960SW
STM6			339.960SW
STM7			340.400NW
WD1	342.40		
WD2	340.36		

SANITARY STRUCTURES			
STRUCTURE ID	T/G ELEV	SPECIFICATIONS	INVERTS
MH1A	338.17	1200mmø	332.173SE 334.270NE 332.173NW
MH2A	339.36	1200mmø	335.464NE 335.464SE 335.414SW
MH3A	341.59	1200mmø	337.518SE 337.468SW
SAN1			338.103NW
SAN2			336.298NW

STORMWATER MANAGEMENT NOTES:

1. FLOWS FROM CATCHMENT AREAS A202, A203 & A204 (AS PER STORMWATER MANAGEMENT BRIEF) UP TO A 25mm STORM EVENT TO BE DIRECTED TO THE INFILTRATION GALLERY;
2. FLOWS FROM CATCHMENT AREA A204 IN EXCESS OF 25mm STORM EVENT TO BE DIRECTED TO A 438cu.m SUBSURFACE STORAGE TANK WITHIN THE PARKING STRUCTURE. THE STORAGE TANK WILL HAVE A 75mm ORIFICE AT ITS INVERT THAT WILL CONTROL FLOW RATES TO THE GORDON STREET STORM SEWER;

DEWATERING NOTES:

1. PUMPED GROUNDWATER WILL BE DIRECTED OFFSITE VIA SWALE AND/OR TEMPORARY PIPE TO GORDON STREET, WHERE THE WATER WILL BE DISCHARGED TO EITHER THE STORM OR SANITARY SEWER SYSTEM.
2. DISCHARGE TO THE STORM AND/OR SANITARY SEWER SYSTEM MUST ADHERE TO THE QUALITY REQUIREMENTS AS PER CITY OF GUELPH BY–LAW NUMBER (1996)–15202.
3. DEWATERING TO FOLLOW BEST MANAGEMENT PRACTICES PER EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN CONSTRUCTION (2006), INCLUDING INSPECTIONS AND PERFORMANCE MONITORING TO ENABLE ADAPTIVE MANAGEMENT.

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

Notes

1. CITY OF GUELPH BENCHMARK 225
ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

	SITE LIMIT
	EX. STORM SEWER
	PROPOSED STORM SEWER
	EX. SANITARY SEWER
	PROPOSED SANITARY SEWER
● S2	PROPOSED SANITARY MANHOLE
R2	PROPOSED STORM MANHOLE
CBMH1	PROPOSED CATCHBASIN MANHOLE
☐ CB or CICB	PROPOSED CATCHBASIN
EX. MH	EX. MANHOLE
☐ EX. CB	EX. CATCHBASIN
	PROPOSED WATERMAIN
	EX. WATERMAIN
	PROPOSED 3–WAY FIRE HYDRANT C/W STORZ CONNECTION
	EX. FIRE HYDRANT
	PROPOSED WATER VALVE
	EX. WATER VALVE

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15

File Name: 161413684_c-db	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	JAC	CJH	JAC	20.04.15

Permit-Seal

C. J. HENDRIKSEN
100125181
April 15/20

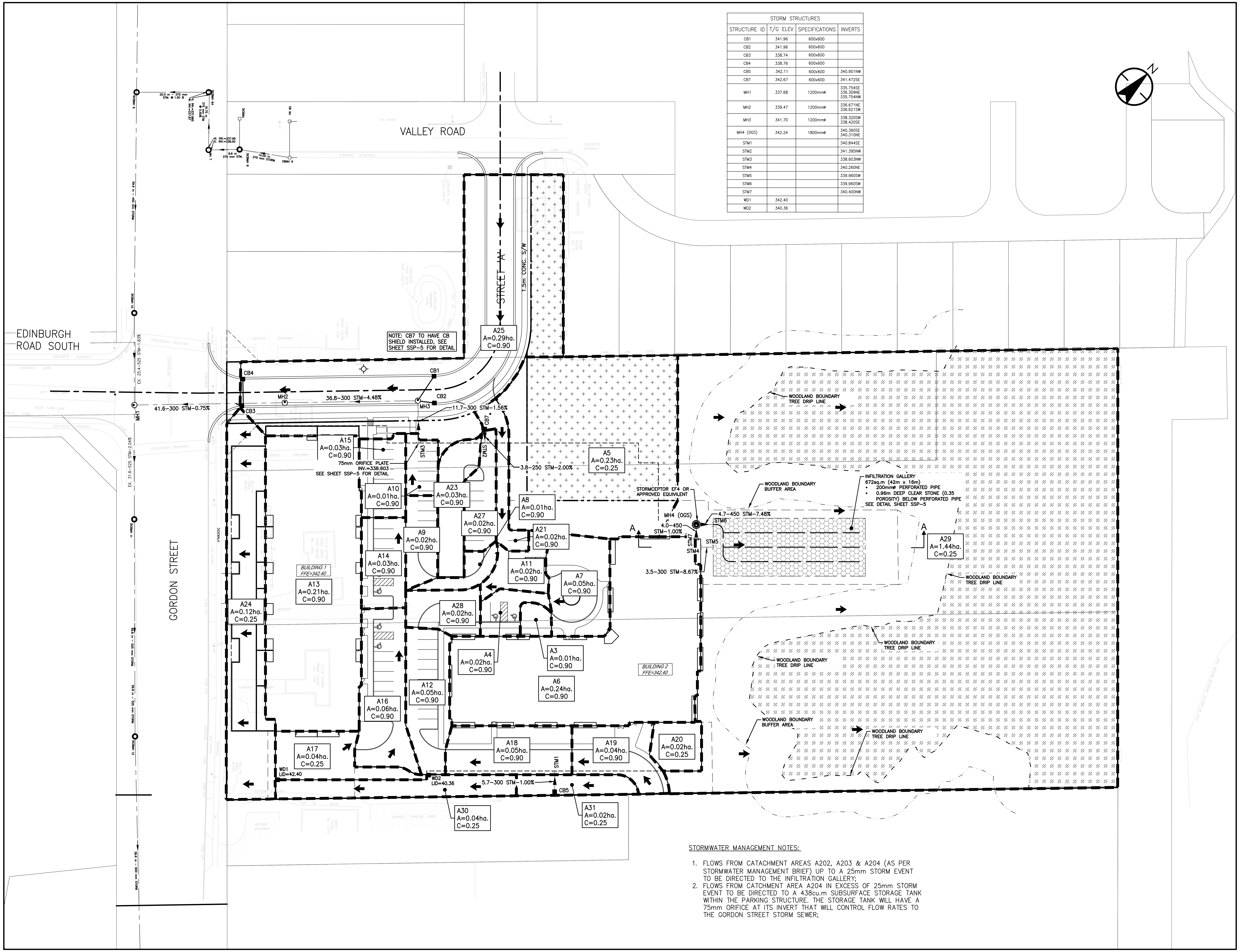
Client/Project
TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title
SERVICING PLAN

Project No. 161413684
Scale 1:500 0 5 15 25m
Drawing No. SSP-1
Sheet 1 of 7
Revision 0



STORM STRUCTURES			
STRUCTURE ID	T/G ELEV	SPECIFICATIONS	INVERTS
CB1	341.96	600x600	
CB2	341.96	600x600	
CB3	338.74	600x600	
CB4	338.76	600x600	
CB5	342.11	600x600	340.901NW
CB7	342.67	600x600	341.472SE
MH1	337.68	1200mmø	335.754SE 336.309NE 335.754NW
MH2	339.47	1200mmø	336.671NE 336.621SW
MH3	341.70	1200mmø	338.320SW 338.420SE
MH4 (OGS)	342.24	1800mmø	340.360SE 340.310NE
STM1			340.844SE
STM2			341.395NW
STM3			338.603NW
STM4			340.260NE
STM5			339.960SW
STM6			339.960SW
STM7			340.400NW
WD1	342.40		
WD2	340.36		

STORMWATER MANAGEMENT NOTES:

1. FLOWS FROM CATACHMENT AREAS A202, A203 & A204 (AS PER STORMWATER MANAGEMENT BRIEF) UP TO A 25mm STORM EVENT TO BE DIRECTED TO THE INFILTRATION GALLERY;
2. FLOWS FROM CATCHMENT AREA A204 IN EXCESS OF 25mm STORM EVENT TO BE DIRECTED TO A 438cu.m SUBSURFACE STORAGE TANK WITHIN THE PARKING STRUCTURE. THE STORAGE TANK WILL HAVE A 75mm ORIFICE AT ITS INVERT THAT WILL CONTROL FLOW RATES TO THE GORDON STREET STORM SEWER;

C:\Users\jchilds\Desktop\Working Folder\161413684 - 1250 Gordon\drawing\civil\sheet_files\161413684_C-SD.dwg
2020-4-15 3:28 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

A1 A=0.23ha. C=0.25	AREA ID CONTRIBUTING AREA (ha) RUNOFF COEFFICIENT
↑	MAJOR OVERLAND FLOOD ROUTE
▬ ▬ ▬	DRAINAGE BOUNDARY

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15

File Name: 161413684_c-sd	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	JAC	CJH	JAC	20.04.15

Permit-Seal

C.J. Hendriksen
C. J. HENDRIKSEN
100125181
April 15/20

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

STORM DRAINAGE AREA PLAN

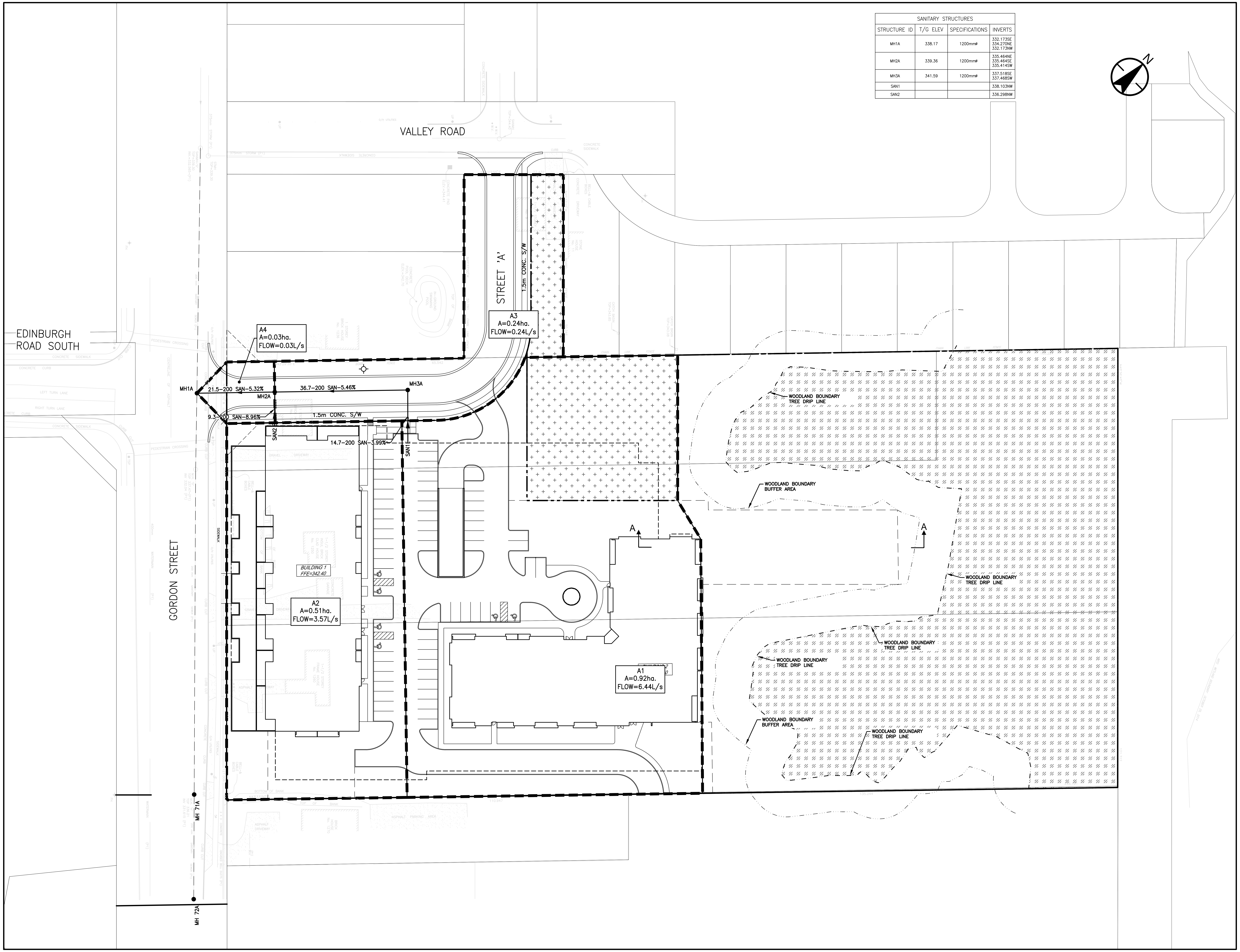
Project No. 161413684

Scale 1:400 0 4 12 20m

Drawing No. SSP-2

Sheet 2 of 7

Revision 0



SANITARY STRUCTURES			
STRUCTURE ID	T/G ELEV	SPECIFICATIONS	INVERTS
MH1A	338.17	1200mmø	332.173SE 334.270NE 332.173NW
MH2A	339.36	1200mmø	335.464NE 335.464SE 335.414SW
MH3A	341.59	1200mmø	337.518SE 337.468SW
SAN1			338.103NW
SAN2			336.298NW

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

A1	AREA ID
A=0.92ha.	CONTRIBUTING AREA (ha)
FLOW=6.44L/s	FLOW RATE (7L/s/ha. APARTMENTS–1L/s/ha. RESIDENTIAL)
▬ ▬ ▬	DRAINAGE BOUNDARY

Revision	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15
Issued	By	Appd.	YY.MM.DD

File Name: 161413684_c-ss	JAC	CJH	JAC	20.04.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

C. J. HENDRIKSEN
100125181
April 15/20

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

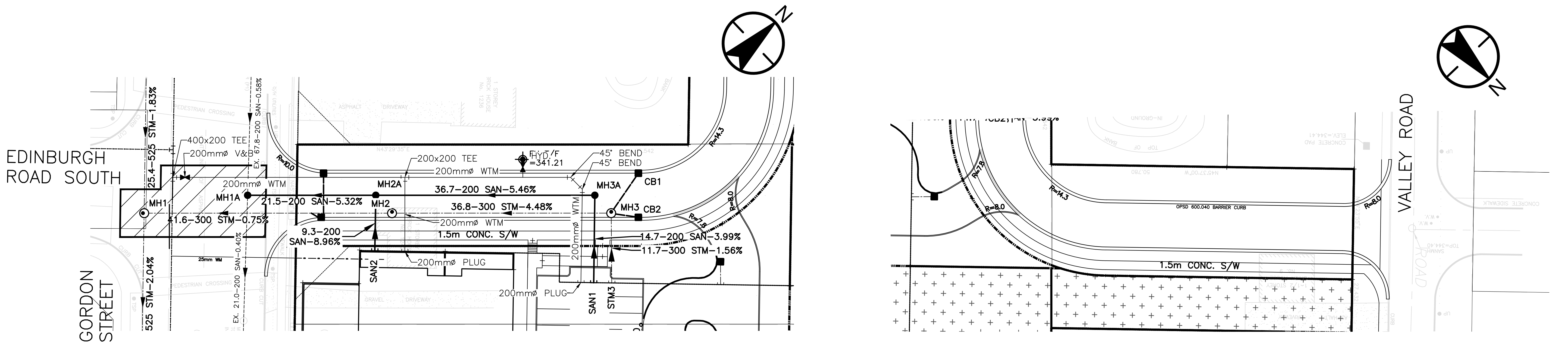
SANITARY DRAINAGE AREA PLAN

Project No.	Scale
161413684	1:500 0 5 15 25m

Drawing No.	Sheet	Revision
SSP-3	3 of 7	0

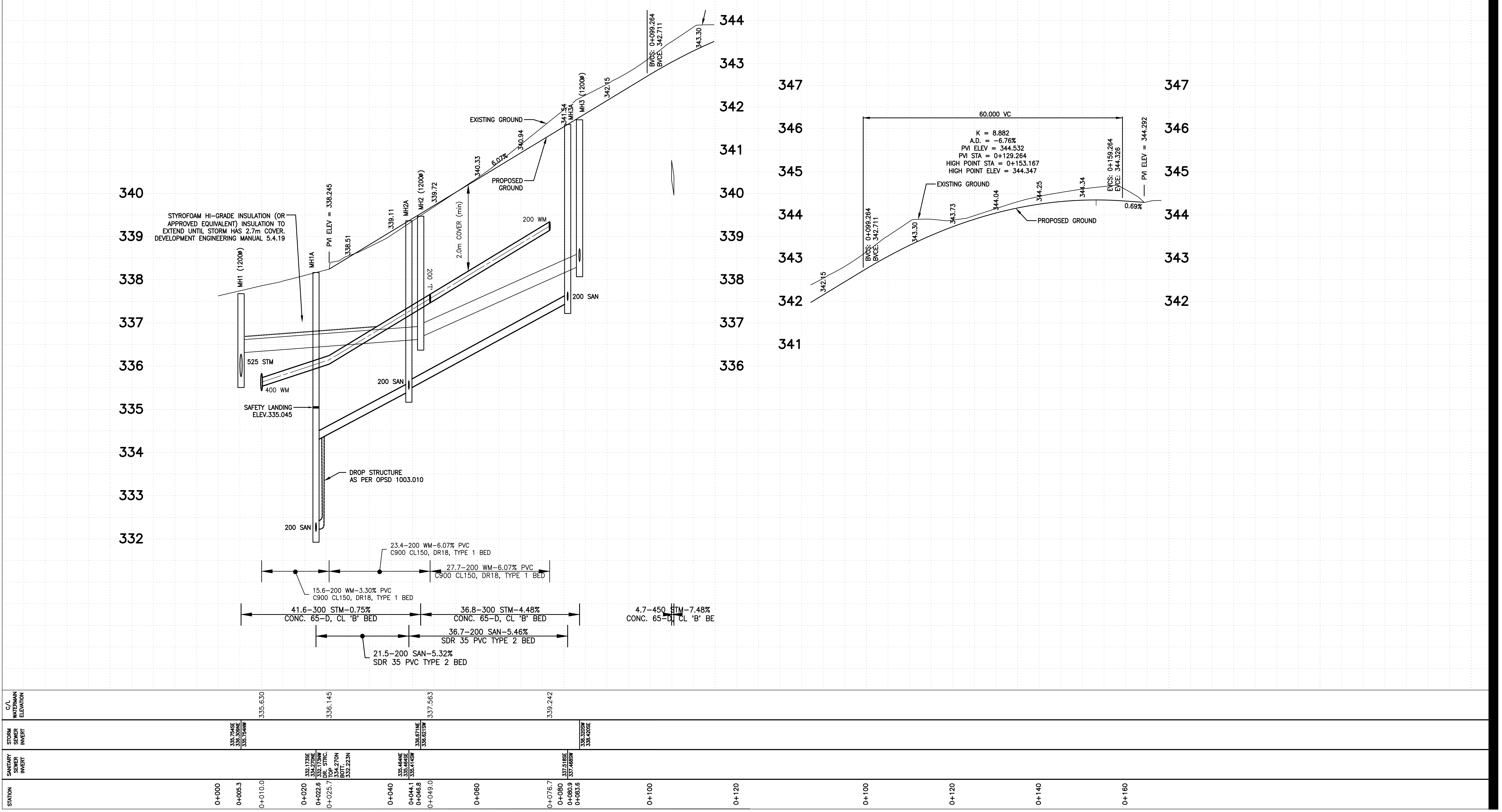
C:\Users\jchilds\Desktop\Working Folder\161413684 - 1250 Gordon\drawing\civil\sheet_files\161413684_C-SS.dwg
2020-4-15 3:10 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D



STREET 'A'

OPSD 600.040 CONCRETE BARRIED CURB WITH STANDARD GUTTER



C:\Users\jchilds\Desktop\Working Folder\161413684 - 1250 Gordon\drawing\civil\sheet_files\161413684_C-ST.dwg
2020-4-15 3:10 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

Stantec

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

▬▬▬	SITE LIMIT
- - -◀- - -	EX. STORM SEWER
━━◀━━	PROPOSED STORM SEWER
──◀──	EX. SANITARY SEWER
━━◀━━	PROPOSED SANITARY SEWER
● S2	PROPOSED SANITARY MANHOLE
⦿ R2	PROPOSED STORM MANHOLE
⦿ CBMH1	PROPOSED CATCHBASIN MANHOLE
☐ CB or CICB	PROPOSED CATCHBASIN
⦿ EX. MH	EX. MANHOLE
☐ EX. CB	EX. CATCHBASIN
━━━	PROPOSED WATERMAIN
───	EX. WATERMAIN
▶◀──○	PROPOSED 3-WAY FIRE HYDRANT C/W STORZ CONNECTION
▷◁──○	EX. FIRE HYDRANT
━▶◀━	PROPOSED WATER VALVE
─▷◁─	EX. WATER VALVE
▨	RESTORATION LIMITS WITH LAP JOINT PER 509.010

Revision	By	Appd.	YY.MM.DD

1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15
Issued	By	Appd.	YY.MM.DD

File Name: 161413684_c-st	JAC	CJH	JAC	20.04.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
C. J. HENDRIKSEN
100125181
April 15/20
PROVINCE OF ONTARIO

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

STREET 'A'
PLAN & PROFILE

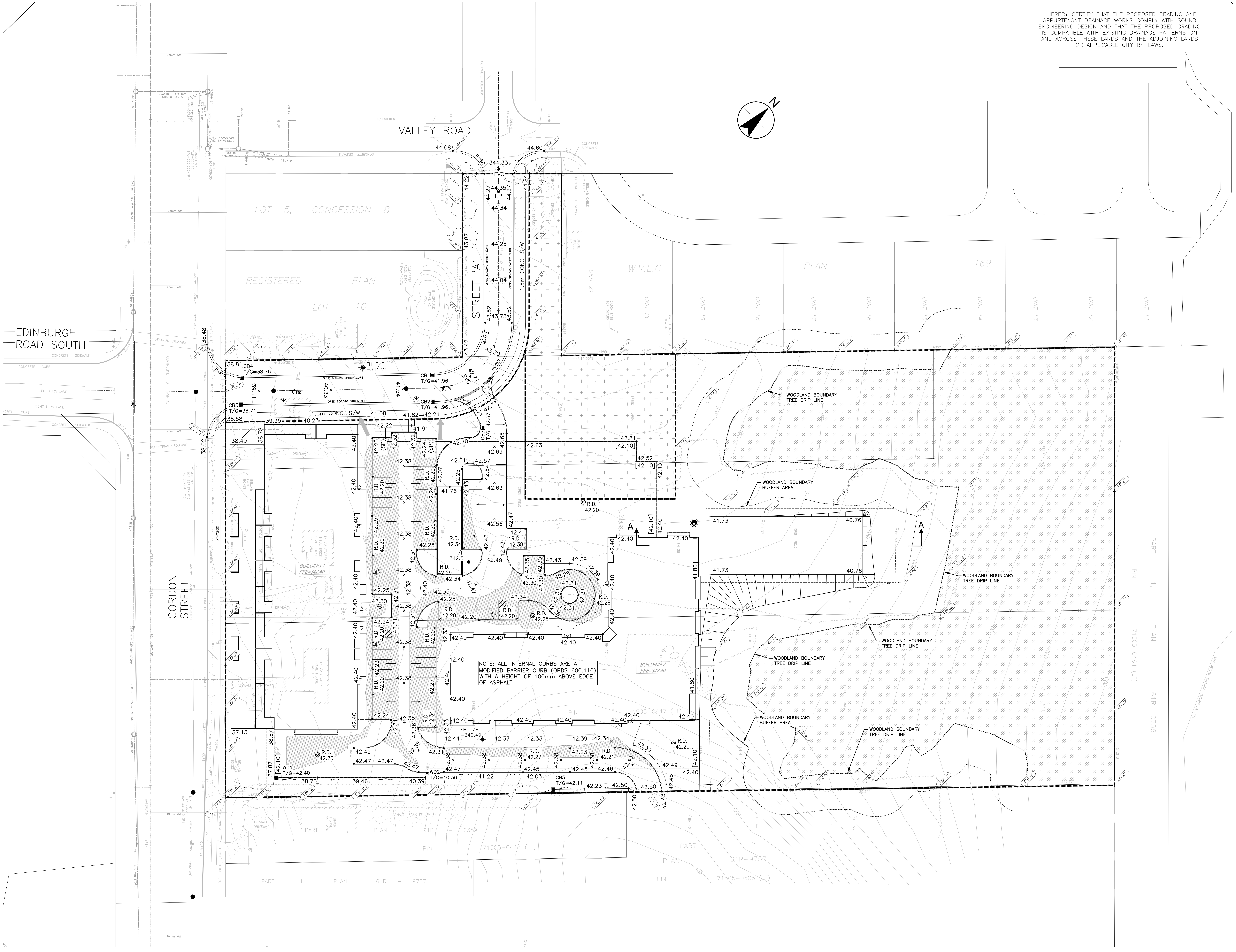
Project No.
161413684

Scale
0 5 15 25m
1:500

Drawing No.
SSP-4

Sheet
4 of 7

Revision
0



I HEREBY CERTIFY THAT THE PROPOSED GRADING AND APPURTENANT DRAINAGE WORKS COMPLY WITH SOUND ENGINEERING DESIGN AND THAT THE PROPOSED GRADING IS COMPATIBLE WITH EXISTING DRAINAGE PATTERNS ON AND ACROSS THESE LANDS AND THE ADJOINING LANDS OR APPLICABLE CITY BY–LAWS.

NOTE: ALL INTERNAL CURBS ARE A MODIFIED BARRIER CURB (OPDS 600.110) WITH A HEIGHT OF 100mm ABOVE EDGE OF ASPHALT

C:\Users\jchilds\Desktop\Working Folder\161413684 - 1250 Gordon\drawing\civil\model_files\surfaces\161413684_C-FB.dwg
2020-4-15 3:10 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

←	PROPOSED SWALE
⊙	PROPOSED STORM MANHOLE
▣	PROPOSED STORM CATCH BASIN MANHOLE
●	PROPOSED SANITARY MANHOLE
⊙	EX. STORM MANHOLE
⊙	EX. SANITARY MANHOLE
□	PROPOSED CATCH BASIN
□	EX. CATCH BASIN
• 75.95	PROPOSED GRADES
• 75.95 (SP)	PROPOSED OVERLAND FLOW SPILL POINT
75.95 +	EXISTING GRADES
⇦	MAJOR OVERLAND FLOW ROUTE
▬ ▮ ▮ ▬	SITE BOUNDARY
• 71.77 (SW)	PROPOSED SWALE GRADE
◌	STRAWBALE FILTER
—□—	HEAVY DUTY SILT FENCE (SD–74b)
180.5	EXISTING CONTOURS
←	FLOW DIRECTION
⊕	HYDRANTS

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15

File Name: 161413684_c-fb	JAC	CJH	JAC	20.04.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

C. J. HENDRIKSEN
100125181
April 15/20

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

GRADING PLAN

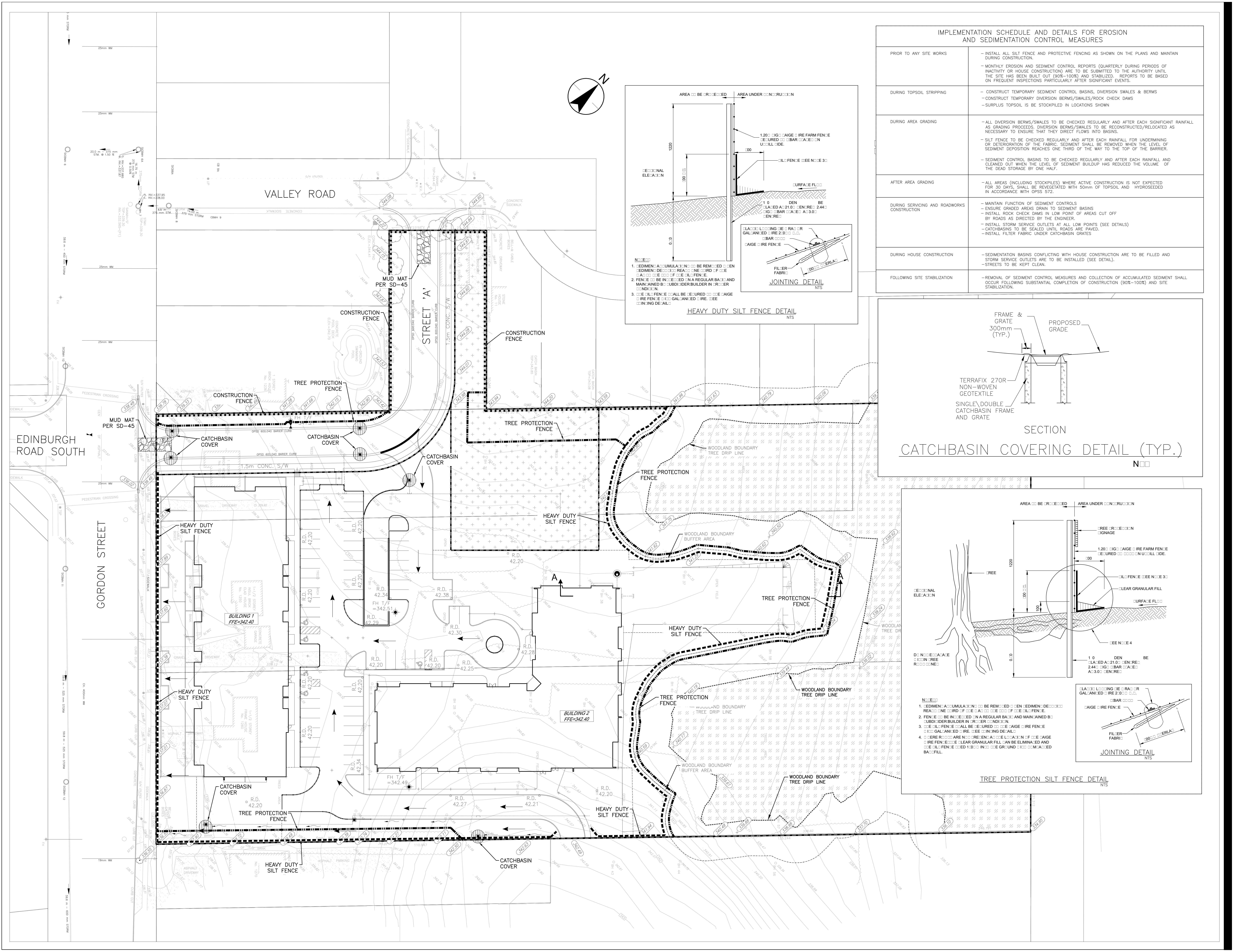
Project No. 161413684

Scale 1:500 0 5 15 25m

Drawing No. GP-1

Sheet 5 of 7

Revision 0



IMPLEMENTATION SCHEDULE AND DETAILS FOR EROSION AND SEDIMENTATION CONTROL MEASURES

PRIOR TO ANY SITE WORKS	– INSTALL ALL SILT FENCE AND PROTECTIVE FENCING AS SHOWN ON THE PLANS AND MAINTAIN DURING CONSTRUCTION. – MONTHLY EROSION AND SEDIMENT CONTROL REPORTS (QUARTERLY DURING PERIODS OF INACTIVITY OR HOUSE CONSTRUCTION) ARE TO BE SUBMITTED TO THE AUTHORITY UNTIL THE SITE HAS BEEN BUILT OUT (90%–100%) AND STABILIZED. REPORTS TO BE BASED ON FREQUENT INSPECTIONS PARTICULARLY AFTER SIGNIFICANT EVENTS.
DURING TOPSOIL STRIPPING	– CONSTRUCT TEMPORARY SEDIMENT CONTROL BASINS, DIVERSION SWALES & BERMS – CONSTRUCT TEMPORARY DIVERSION BERMS/SWALES/ROCK CHECK DAMS – SURPLUS TOPSOIL IS BE STOCKPILED IN LOCATIONS SHOWN
DURING AREA GRADING	– ALL DIVERSION BERMS/SWALES TO BE CHECKED REGULARLY AND AFTER EACH SIGNIFICANT RAINFALL AS GRADING PROCEEDS. DIVERSION BERMS/SWALES TO BE RECONSTRUCTED/RELOCATED AS NECESSARY TO ENSURE THAT THEY DIRECT FLOWS INTO BASINS. – SILT FENCE TO BE CHECKED REGULARLY AND AFTER EACH RAINFALL FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES ONE THIRD OF THE WAY TO THE TOP OF THE BARRIER. – SEDIMENT CONTROL BASINS TO BE CHECKED REGULARLY AND AFTER EACH RAINFALL AND CLEANED OUT WHEN THE LEVEL OF SEDIMENT BUILDUP HAS REDUCED THE VOLUME OF THE DEAD STORAGE BY ONE HALF.
AFTER AREA GRADING	– ALL AREAS (INCLUDING STOCKPILES) WHERE ACTIVE CONSTRUCTION IS NOT EXPECTED FOR 30 DAYS, SHALL BE REVEGETATED WITH 50mm OF TOPSOIL AND HYDROSEEDED IN ACCORDANCE WITH OPSS 572.
DURING SERVICING AND ROADWORKS CONSTRUCTION	– MAINTAIN FUNCTION OF SEDIMENT CONTROLS – ENSURE GRADED AREAS DRAIN TO SEDIMENT BASINS – INSTALL ROCK CHECK DAMS IN LOW POINT OF AREAS CUT OFF BY ROADS AS DIRECTED BY THE ENGINEER. – INSTALL STORM SERVICE OUTLETS AT ALL LOW POINTS (SEE DETAILS) – CATCHBASINS TO BE SEALED UNTIL ROADS ARE PAVED. – INSTALL FILTER FABRIC UNDER CATCHBASIN GRATES
DURING HOUSE CONSTRUCTION	– SEDIMENTATION BASINS CONFLICTING WITH HOUSE CONSTRUCTION ARE TO BE FILLED AND STORM SERVICE OUTLETS ARE TO BE INSTALLED (SEE DETAIL). – STREETS TO BE KEPT CLEAN.
FOLLOWING SITE STABILIZATION	– REMOVAL OF SEDIMENT CONTROL MEASURES AND COLLECTION OF ACCUMULATED SEDIMENT SHALL OCCUR FOLLOWING SUBSTANTIAL COMPLETION OF CONSTRUCTION (90%–100%) AND SITE STABILIZATION.

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

─	PROPERTY LINE
▶	DIVERSION SWALE
▨	TOPSOIL STOCKPILE
▨	FILL MATERIAL STOCKPILE
▨	CONSTRUCTION ENTRANCE
▨	ANGULAR RIP RAP
▨	STRAW BALE DAM
▨	ROCK CHECK DAM
▪▪▪	SILT FENCE (SD–74B)
▪▪▪	CONSTRUCTION FENCE
▪▪▪	TREE PROTECTION FENCE (SD–90A)
─	TEMPORARY STORM SEWER
┴	SEDIMENT BASIN SLOPES
Ⓢ	SEDIMENT TRAP (SEE DETAIL C–610)
←	SURFACE FLOW DIRECTION
▪▪▪	DIVERSION BERM
●	CATCHBASIN COVERING

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15

File Name: 161413684_c-esc	JAC	CJH	JAC	20.04.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

C. J. HENDRIKSEN
100125181
April 15/20

Client/Project
TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title
EROSION & SEDIMENT CONTROL PLAN

Project No. 161413684
Scale 1:400 0 4 12 20m
Drawing No. GP-2
Sheet 6 of 7
Revision 0

C:\Users\jchilds\Desktop\Working Folder\161413684 - 1250 Gordon\drawing\civil\sheet_files\161413684_C-ESC.dwg
2020-4-15 3:10 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

NOTES AND SPECIFICATIONS:

A. GENERAL:

1. BUILDINGS ARE NOT TO BE SITED WITH THIS DRAWING. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE SITE SERVICING PLANS (SSP SERIES) & THE GRADING PLAN (GP SERIES) PREPARED BY STANTEC CONSULTING.
2. THESE PLANS FOR CONSTRUCTION ONLY WHEN APPROVED BY THE CITY OF GUELPH AND SEALED BY THE ENGINEER.
3. THE CONTRACTOR MUST CHECK AND VERIFY DIMENSIONS; OBTAIN ALL UTILITY LOCATES AND OBTAIN ALL REQUIRED PERMITS/LICENSES AND VERIFY ELEVATIONS OF EXISTING SERVICES BEFORE PROCEEDING WITH ANY WORK.
4. ALL WORK WITHIN THE RIGHTS–OF–WAY OR CITY EASEMENTS ARE TO BE INSTALLED BY CITY OF GUELPH AT THE OWNER'S EXPENSE UNLESS OTHERWISE NOTED.
5. ANY PROPOSED CHANGES SHALL BE APPROVED BY THE ENGINEER AND CITY OF GUELPH.
6. ALL UNDERGROUND SERVICING TO BE INSPECTED BY STANTEC CONSULTING LTD. AND CERTIFIED FOR THE CITY OF GUELPH. CONTRACTOR SHALL COORDINATE WITH STANTEC AND SHALL CONTACT SAME AT LEAST 48 HOURS PRIOR TO INSTALLATION OF SERVICES.
7. CONTRACTOR SHALL COORDINATE WITH STANTEC AND SHALL CONTACT SAME AT LEAST 48 HOURS PRIOR TO INSTALLATION OF SERVICES.
8. ALL CONSTRUCTION WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS (LATEST EDITION).
9. THE PROPERTY OWNER IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT–OF–WAY TO CITY OF GUELPH STANDARDS.
10. IF, FOR UNFORESEEN REASONS, THE OWNER AND/OR HIS/HER REPRESENTATIVE MUST ENCROACH ONTO PRIVATE LANDS TO UNDERTAKE ANY WORKS, HE/SHE MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNERS PRIOR TO ENTERING UPON THE PRIVATE PROPERTY TO PERFORM ANY WORKS. COPIES OF THESE LETTERS OF CONSENT MUST BE SUBMITTED TO THE DEVELOPMENT & TECHNICAL SERVICES – ENGINEERING DEVELOPMENT DIVISION, PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT THE PROPERTY OWNERS OWN RISK.

B. UNDERGROUND SERVICES:

1. CONTRACTOR SHALL VERIFY ELEVATION AND LOCATION OF EXISTING SANITARY AND STORM SEWERS AND WATERMAINS PRIOR TO COMMENCING SITE WORK AND SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BETWEEN EXISTING AND PROPOSED SERVICES.
2. THE CONTRACTOR TO MAKE CONNECTIONS TO SERVICES AT STUB LOCATION FOR SANITARY, STORM SEWERS, WATERMAIN AND TO RESTORE ALL OFF–SITE AFFECTED PROPERTY TO ORIGINAL CONDITION.
3. ON–SITE SERVICING SHALL NOT BE UNDERTAKEN PRIOR TO COMPLETION OF SERVICE CONNECTIONS WITHIN THE ROAD R.O.W.'S.
4. ALL UNDERGROUND SERVICES TO BE IN COMPLIANCE WITH THE LATEST REVISED BUILDING CODE, CITY OF GUELPH ENGINEERING STANDARDS, ONTARIO PROVINCIAL STANDARDS (OPSS, OPSD) AND WITH THE LATEST REGULATIONS OF THE ONTARIO PLUMBING CODE AND SUPPLEMENT SPECIFICATION FOR MUNICIPAL SERVICES (DGSSMS) AND INSPECTED BY CITY STAFF/CONSULTANT PRIOR TO BACKFILLING.
5. UNDERGROUND SERVICES TO TERMINATE 1.5m FROM BUILDING LINE, PLUGGED OR CAPPED C/W MARKER EXTENDING FROM INVERT TO 1.0M ABOVE FINISHED GRADE.
6. ALL BEDDING TO BE AS NOTED BELOW. TRENCH BACKFILL TO BE APPROVED NATIVE MATERIAL COMPACTED IN 200mm MAX. LIFTS TO 95% STANDARD PROCTOR DENSITY.
7. ALL SERVICES SHALL BE TESTED AS SPECIFIED IN THE APPLICABLE OPSS (OPSS 410 & 441).
8. ALL SERVICES, UTILITIES AND CATCHBASIN LEADS ARE TO BE SUPPORTED AS PER OPSD 1007.01 DURING TRENCHING ACTIVITIES. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES PRIOR TO AND DURING CONSTRUCTION. LOCATION OF EXISTING UTILITIES TO BE VERIFIED IN THE FIELD.
9. ANY UTILITY RELOCATION DUE TO THIS DEVELOPMENT TO BE UNDERTAKEN AT THE EXPENSE OF THE OWNER/DEVELOPER.

C. SEWERS/APPURTENANCES:

4. STORM SEWERS:
   - LESS THAN 200mmø – PVC DR–28
   - 200mmø TO 375mmø – PVC DR–35
     – PVC RIBBED PIPE (ULTRA–RIB OR EQUIVALENT)
     – CL–3 CONCRETE
   - 450mmø TO 600mmø – PVC RIBBED PIPE (ULTRA–RIB OR EQUIVALENT)
     – 65D CONCRETE
   - 450mmø TO 600mmø – 65D CONCRETE
5. SANITARY SEWERS:
   - LESS THAN 200mmø – PVC DR–28
   - 200mmø OR LARGER – PVC DR–35
   - 2.5m MINIMUM COVER FOR SANITARY SEWERS.
3. SEWER BEDDING:
   - CITY OF GUELPH SD–29
   - 150mm (MIN) GRAN 'A' TO 98% S.P.D.
4. STORM MANHOLES:
   - OPSD 701.010 (1200mmø)
   - OPSD 701.011 (1500mmø)
   - OPSD 701.012 (1800mmø)
   - OPSD 701.013 (2400mmø)
   - OPSD 701.014 (3000mmø)
6. SANITARY MAINTENANCE HOLE:
   - OPSD 701.010 (1200mmø)
7. MAINTENANCE HOLE BENCHING:
   - CITY OF GUELPH SD–44
   - CBMH'S WITH AN OUTLET PIPE GREATER THAN 450mmø SHOULD BE BENCHED. 450mmø OR LESS SHALL BE PROVIDED WITH A 600mm SUMP.
8. CATCHBASINS/CATCHBASIN LEADS:
   - OPSD 705.01 (SINGLE)
   - OPSD 705.02 (DOUBLE)
   - OPSD 705.03 (DITCH INLET – 3:1 SLOPE)
   - MINIMUM LEAD DIAMETER. 200mmø FOR SINGLE, 300mmø FOR DOUBLE CATCHBASINS.
9. FRAMES AND GRATES/COVERS:
   - OPSD 400.10 (CB'S & CBMH'S)
   - OPSD 401.01 TYPE 'A' (SANITARY AND STORM MH'S)
   - CITY OF GUELPH SD–15 (RLCB'S)
   - CITY OF GUELPH SD–16 (DICB'S)
   - CITY OF GUELPH SD–9 (SAFETY GRATE FOR MH'S)
   - ALL FRAMES ON STRUCTURES TO BE SET USING PRECAST CONCRETE ADJUSTMENT UNITS

D. WATER SERVICES/APPURTENANCES:

1. WATERMAIN
   - 100mmø TO 300mmø – AWWA C–900 PVC SDR–18
   - 350mmø TO 600mmø – AWWA C905 PVC SDR–25
   - 2.0m MINIMUM COVER
   - FITTINGS TO AWWA C–907
   - WHERE CONFLICT ARISES AT WATERMAIN/SERVICE CROSSING OTHER UNDERGROUND SERVICES, WATERMAIN/SERVICES SHALL BE LOWERED TO MAINTAIN 0.50m VERTICAL SEPARATION.
2. PIPE BEDDING:
   - CITY OF GUELPH SD–29
   - 150mm (MIN) GRANULAR 'A' 98% S.P.D.
3. THRUST BLOCKING:
   - CITY OF GUELPH SD–27
4. TRACER WIRE:
   - CITY OF GUELPH SD–54A
5. HYDRANTS:
   - CITY OF GUELPH SD–25A (OPEN RIGHT)
6. VALVES:
   - ALL VALVES TO OPEN COUNTER–CLOCKWISE AND COMPLY WITH A.W.W.A. SPEC.
   - CITY OF GUELPH SD–24
7. WATER SERVICES
   - 25mmø TYPE K COPPER PIPING WET TAPPED TO PVC WATERMAIN WITH APPROVED SADDLE
   - CITY OF GUELPH SD–54B
8. WATER METERS:
   - BUILDING UNITS TO HAVE INDIVIDUAL WATER METERS TO THE SATISFACTION OF CITY OF GUELPH WATERWORKS DEPARTMENT
9. MAINTAIN SPATIAL SEPARATION FOR SITE SERVICES PER BUILDING CODE PART 7.3.5.6
10. ALL NEW WATER PIPING INSTALLATIONS AS PER AWWA C651–05
11. CATHODIC PROTECTION IN ACCORDANCE WITH CITY OF GUELPH STANDARDS.
12. A WATERMAIN COMMISSIONING PLAN IN ACCORDANCE WITH DGSSMS WILL BE REQUIRED.

E. GRADING:

1. COMPLETE ALL EXCAVATION, GRADING, TRIMMING AND COMPACTION AS REQUIRED TO FACILITATE THE WORK, ALL SUBGRADE AREAS SHALL BE PROOF ROLLED TO 98% S.D.P. PRIOR TO GRANULAR SUBBASE PLACEMENT.
2. DISPOSE OF ALL SURPLUS AND UNSUITABLE MATERIAL OFFSITE.
3. SAWCUT ASPHALT IN NEAT LINES AT ALL MATCH LINES.
4. MATCH EXISTING GRADES AT ADJACENT PROPERTY LINES.
5. TRANSITION SLOPES TO BE MAXIMUM 3:1 (HORIZONTAL TO VERTICAL) UNLESS OTHERWISE NOTED.

F. SURFACE WORKS:

1. CURBS:
   - OPSD 600.040 (CONCRETE BARRIER CURB WITH STANDARD GUTTER)
   - OPSD 600.070 (CONCRETE BARRIER CURB WITH STANDARD GUTTER, TWO STAGE CONSTRUCTION)
   - OPSD 600.080 (CONCRETE BARRIER CURB WITH NARROW GUTTER)
   - OPSD 600.110 (CONCRETE BARRIER CURB)
2. ASPHALT PAVEMENT: (PARKING AREA)

40mm HL 3 (SURFACE ASPHALT)	97% MARSHALL
50mm HL4 (BASE ASPHALT)	97% S.P.D.
150mm GRANULAR 'A' BASE	100% S.P.D.
300mm GRANULAR 'B' SUB–BASE	100% S.P.D.

3. ASPHALT PAVEMENT: (ABOVE PARKING GARAGE)

CONCRETE DECK	
ROOFING MEMBRANE	
PROTECTION BOARD	
40MM HL 3 (SURFACE ASPHALT)	97% MARSHALL
50MM HL4 (BASE ASPHALT)	97% S.P.D.

4. PAVEMENT: (HEAVY DUTY/FIRE ROUTE)

50mm HL–3 SURFACE ASPHALT	97% MARSHALL – (WHERE IN PLACE)
60mm HL–4 BASE ASPHALT	97% MARSHALL
150mm GRANULAR 'A'	100% S.P.D.
400mm GRANULAR 'B'	100% S.P.D.

   - SAW CUT CLEAN EDGES AT ALL MATCH LINES AND APPLY TACK COAT.
5. CONCRETE SIDEWALKS:
   - CITY OF GUELPH SD–2, 1.5m WIDE (CONCRETE SIDEWALK)
   - CITY OF GUELPH SD–4 (SIDEWALK RAMPS)
6. SITE AREAS DISTURBED BY CONSTRUCTION AND NOT INDICATED FOR REMOVAL TO BE RESTORED TO ORIGINAL CONDITIONS.

G. EROSION CONTROL:

1. ALL SILT FENCING TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY AREA GRADING, EXCAVATION OR DEMOLITION.
2. EROSION CONTROL FENCE TO BE PLACED AROUND THE BASE OF ALL STOCKPILES. ALL STOCKPILES TO BE KEPT A MINIMUM OF 2.5m FROM ALL PROPERTY LINES.
3. P–250 FILTER FABRIC UNDERLYING CONSTRUCTION VEHICLE ENTRANCE TO CONSIST OF CLEANED OR REPLACED 200mm THICK, 50mmø STONE. STONE TO BE TAKEN UP AND WHEN ACCUMULATIONS COVER 50% OF TOP OF STONE (SEE DETAIL).
4. EROSION PROTECTION TO BE PROVIDED AROUND ALL STORM AND SANITARY MANHOLES AND/OR CATCHBASINS.
5. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.
6. EROSION CONTROL STRUCTURES TO BE MONITORED REGULARLY BY STANTEC CONSULTING LTD. AND ANY DAMAGE REPAIRED IMMEDIATELY. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF ONE THIRD (1/2) THE HEIGHT OF THE SILT FENCE.
7. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RE–STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
8. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY STANTEC CONSULTING LTD. AND THE CITY OF GUELPH'S WORKS DEPARTMENT
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING SEDIMENTS FROM THE MUNICIPAL ROAD AND SIDEWALKS AT THE END OF EACH WORK DAY.
10. MUD MATS TO BE PROVIDED ON SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. MUD MATS SHALL BE A MINIMUM OF 3.0m WIDE, 15.0m LONG (LENGTH MAY VARY DEPENDING ON SITE LAYOUT) AND 0.3m DEEP AND SHALL CONSIST OF 20mm CLEAR STONE MATERIAL OR APPROVED EQUIVALENT. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE ITS EFFECTIVENESS AT ALL TIMES.
11. STANTEC CONSULTING LTD. TO MONITOR THE SITE DEVELOPMENT TO ENSURE ALL EROSION CONTROLS ARE INSTALLED AND MAINTAINED TO CITY REQUIREMENTS. CONTRACTOR TO COMPLY WITH THE ENGINEER'S INSTRUCTIONS TO INSTALL, MODIFY, OR MAINTAIN EROSION CONTROL WORKS.

H. RETAINING WALLS:

1. RETAINING WALL TO BE CONSTRUCTED AS DESIGNED BY OTHERS. APPROPRIATE CONSTRUCTION DETAILS SHALL BE PROVIDED FOR RETAINING WALLS HIGHER THAN 0.80m. DETAILS SHALL BE DESIGNED AND SEALED BY A PROFESSIONAL ENGINEER UPON APPROVAL. GUARD RAIL IS REQUIRED WHEN HEIGHT EXCEEDS 0.80m.
2. CONTRACTOR TO CONTACT GEOTECHNICAL ENGINEER 48 HOURS PRIOR TO CONSTRUCTION OF RETAINING WALL TO ALLOW FOR INSPECTION OF SOIL CONDITIONS.
3. ANY CHANGES IN WALL HEIGHT MUST BE APPROVED BY THE ENGINEER.
4. BUILDING PERMIT MUST BE OBTAINED FOR RETAINING WALL

I. DEWATERING NOTES:

1. PUMPED GROUNDWATER WILL BE DIRECTED OFFSITE VIA SWALE AND/OR TEMPORARY PIPE TO POPPY DRIVE EAST, WHERE THE WATER WILL BE DISCHARGED TO EITHER THE STORM OR SANITARY SEWER SYSTEM.
2. DISCHARGE TO THE STORM AND/OR SANITARY SEWER SYSTEM MUST ADHERE TO THE QUALITY REQUIREMENTS AS PER CITY OF GUELPH BY–LAW NUMBER (1996)–15202.

J. MISCELLANEOUS:

1. WHERE COVER OVER SEWERS IS LESS THAN 1.2m IN PAVED AREAS, OR LESS THAN 0.90m IN GRASSED AREAS INSTALL INSULATION AS PER DETAIL. INSULATION TO BE 60mm THICK x 1800mm WIDE UNLESS OTHERWISE NOTED. INSTALL LONGITUDINALLY OVER CENTERLINE OF PIPE WITH OVERLAPPING JOINTS.
2. IT IS THE SITE OWNERS' RESPONSIBILITY TO ENSURE THAT ALL SEDIMENT CONTROLS ARE IMPLEMENTED AND MAINTAINED IN ACCORDANCE WITH THE ABOVE CRITERIA.

UNDERGROUND STORAGE AND INFILTRATION TRENCHES

1 PRIOR TO INSTALLATION

- EFFORTS SHOULD BE MADE TO AVOID COMPACTION BY NOT USING THE FACILITY LOCATION AS:
- OLAYDOWN OR STOCKPILE LOCATIONS;
- OEQUIPMENT STORAGE;
- OTRAFFIC FLOW OR SITE ACCESS.
- MATERIAL TO BE USED IN THE CONSTRUCTION OF THE FACILITY SHOULD NOT BE BROUGHT ON SITE PRIOR TO IT BEING NEEDED. IF THIS MATERIAL IS ON SITE PRIOR TO FINAL PLACEMENT, IT SHALL BE STOCKPILED SEPARATELY FROM ANY OTHER CONSTRUCTION MATERIALS AND ADEQUATELY PROTECTED (AS DIRECTED BY THE LID INSPECTOR).

2 INSTALLATION

- TRENCH FLOOR TO BE SCARIFIED TO A DEPTH OF 0.15M UNLESS THE LID INSPECTOR DIRECTS GREATER DEPTHS OF SCARIFICATION.
- ONCE THE AREA IS SCARIFIED, AT LEAST 2 LOCATIONS IN EACH FACILITY ARE TO BE TESTED FOR IN–SITU INFILTRATION RATE. ADDITIONAL SCARIFICATION MAY BE REQUIRED FOLLOWING THESE TESTS, AFTER WHICH THE TESTS SHOULD BE COMPLETED AGAIN IN OTHER LOCATIONS.
- SHOULD THE TRENCH WORK BE COMPLETED IN ADVANCE ON THE INSTALLATION OF THE GEOTEXTILE AND STONE, THE TRENCH SHOULD BE PROTECTED IN THE EVENT OF RAIN.
- THE OVERLAP ON THE GEOTEXTILE SHALL BE A MINIMUM OF 0.3M. THE GEOTEXTILE SHALL BE WRAPPED OVERTOP OF THE STONE STORAGE AT THE MINIMUM OVERLAP.
- ALL STONE INSTALLED IS TO BE TRIPLE WASHED TO PREVENT DUST FROM CLOGGING THE FABRIC AND SOIL PORES. STONE IS TO BE INSTALLED IN LIFTS OF 0.3M MAXIMUM. THESE LIFTS SHOULD BE LIGHTLY WORKED TO SETTLE THE STONE BUT MECHANICAL COMPACTION IS NOT TO BE USED.
- ALL UNDERDRAIN PIPES ARE TO BE WRAPPED IN A SEDIMENT SOCK.
- IF THE FACILITY IS COMPLETED PRIOR TO SITE STABILIZATION, RUNOFF SHOULD BE DIRECTED AWAY FROM THE FACILITY TO PREVENT HEAVY SEDIMENTATION. EROSION CONTROLS SHOULD BE INSTALLED AS PER THE DIRECTION OF THE LID INSPECTOR.

3 MAINTENANCE

- REMOVE ANY DEBRIS, GARBAGE, LEAVES, STICKS, OR OTHER ITEMS FROM THE FACILITY INLETS. THIS SHOULD BE DONE BIANNUALLY WITH SPECIAL ATTENTION IN FALL TO REMOVE FALLEN LEAVES;
- REMOVE ACCUMULATED SEDIMENT FROM THE BOTTOM OF THE FACILITY AS NEEDED BY FLUSHING;
- MONITOR PERFORMANCE; OBSERVE WATER DEPTHS IN THE FACILITY DURING RAIN EVENTS BIANNUALLY.

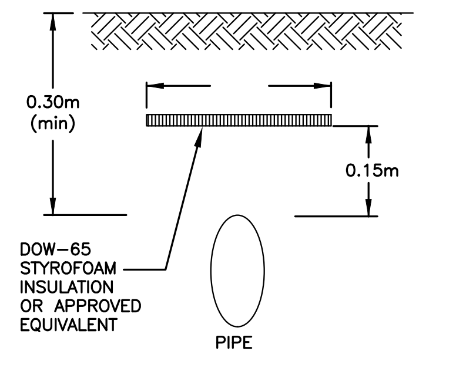
OIL GRIT SEPARATOR

1 INSTALLATION

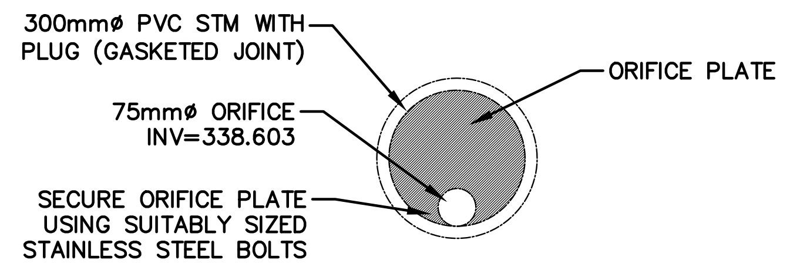
- ONCE INSTALLED, THE INLET TO THE OGS SHOULD BE SURROUNDED BY A FILTER SOCK RING TO REMOVE THE HEAVIEST SEDIMENT LOADS. THE OGS SHOULD BE INSPECTED BIWEEKLY DURING CONSTRUCTION AND CLEANED BY VACUUM TRUCK WHEN THE SUMP IS 50% FULL OF SILT.
- WHEN CONSTRUCTION IS COMPLETE, THE OGS SHOULD BE CLEANED OF ANY SEDIMENT.

2 MAINTENANCE

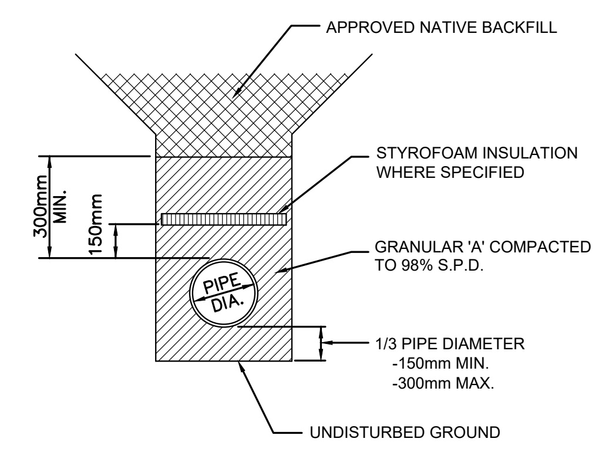
- INSPECTION SHOULD BE DONE BIANNUALLY;
- REMOVE ACCUMULATED SEDIMENT FROM THE BOTTOM OF THE FACILITY WHEN 50% FULL BY VACUUM TRUCK;
- REMOVAL OF ANY OILS OR FLOATABLES AS NEEDED, WITH SPECIAL ATTENTION PAID IN THE EVENT OF A DELETERIOUS SPILL.



INSULATION DETAIL
NTS

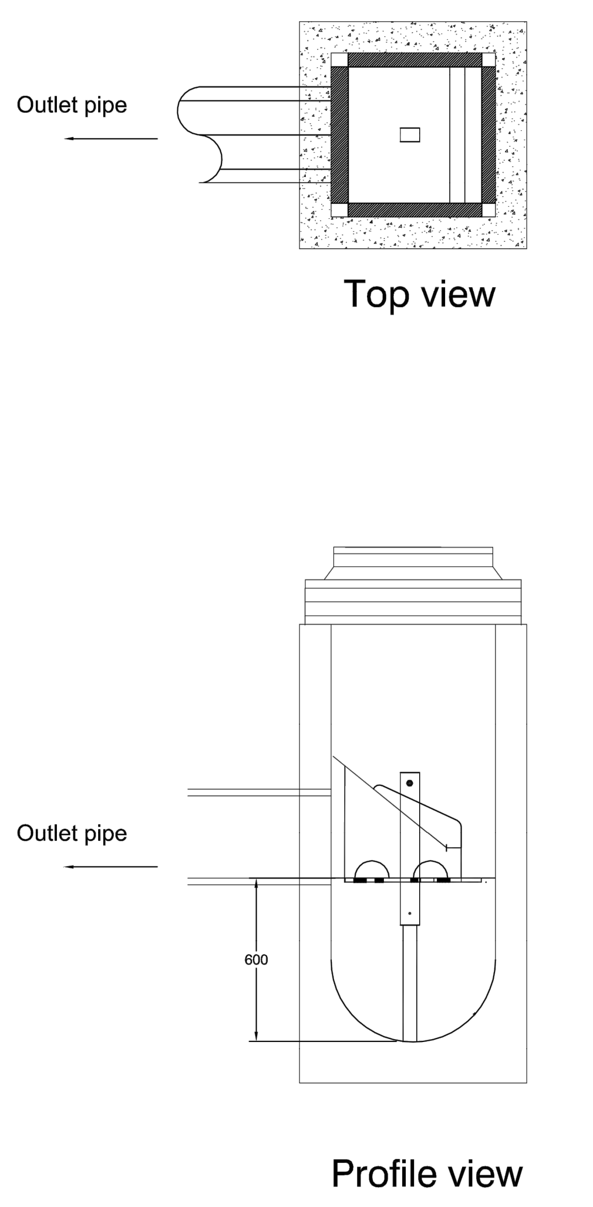


ORIFICE PLATE DETAIL
NTS

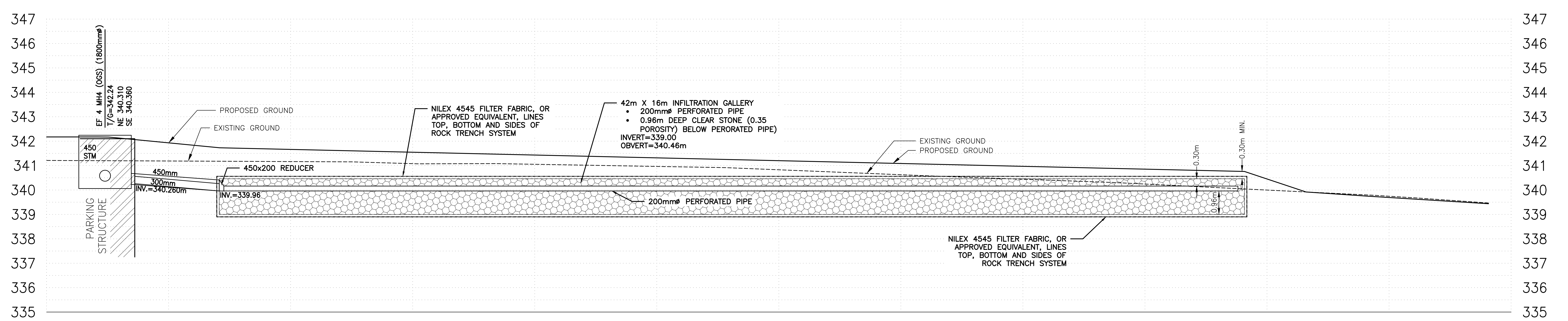


TYP. PIPE BEDDING DETAIL
NTS

Notes
1. CB Shield can be installed at any time. In a non frozen condition.
2. The frame and cover should be well aligned with the catchbasin for proper installation
3. The catchbasin sump must be clean before installation
4. The grate should be at the same level as the standing water in the sump.



CB Shield (600mm Sump)



INFILTRATION GALLERY A–A
SCALE – 1:100

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

Revision	By	Appd.	YY.MM.DD

1. FOR SITE PLAN APPROVAL	JAC	CJH	20.04.15
Issued	By	Appd.	YY.MM.DD

File Name: 161413684_c-dt	JAC	CJH	JAC	20.04.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

C. J. HENDRIKSEN
100125181
April 15/20

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

NOTES & DETAILS

Project No. 161413684
Scale 1:500 0 5 15 25m
Drawing No. SSP-5
Sheet 7 of 7
Revision 0

FIGURE 1 – EXISTING STORM DRAINAGE CONDITIONS

Stantec

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225 ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

101 A=1.73	AREA ID CONTRIBUTING AREA (ha)
↑	MAJOR OVERLAND FLOOD ROUTE
- - - -	DRAINAGE BOUNDARY

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.01.20

File Name: 161413684_c-sd_ex	DRR	CJH	DRR	19.05.31
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

EXISTING STORM DRAINAGE CONDITIONS

Project No.
161413684

Scale
1:400
0 4 12 20m

Drawing No. 1

Sheet 1 of 2

Revision 0

V:\01614\active\161413684\design\drawing\report figures\161413684_C-SD_ex.dwg
2020-2-27 4:02 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

PROPOSED STORM DRAINAGE CONDITIONS

INFILTRATION TRENCH
A=672sq.m (42mx16)
200mmø PERFORATED PIPE
0.96m DEEP CLEAR STONE BELOW
PERFORATED PIPE

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note:

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. CITY OF GUELPH BENCHMARK 225
   ELEVATION 338.665 LOCATION: 1221 GORDON STREET
2. EXISTING SURVEY COMPLETED BY BSR&D (NOVEMBER, 4 2014)
3. THE CONTRACTOR IS TO VERIFY ALL EXISTING ELEVATIONS AND EXISTING CONDITIONS AND TO REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER
4. SITE PLAN PREPARED BY STANTEC, DATED JANUARY, 2020.

Legend

201	AREA ID
A=0.12	CONTRIBUTING AREA (ha)
↑	MAJOR OVERLAND FLOOD ROUTE
▬ ▬ ▬	DRAINAGE BOUNDARY

Revision	By	Appd.	YY.MM.DD

	By	Appd.	YY.MM.DD
1. FOR SITE PLAN APPROVAL	JAC	CJH	20.03.24

Issued

File Name: 161413684_c-sd_prop	DRR	CJH	DRR	19.05.31
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

TRICAR DEVELOPMENTS INC.

1250 GORDON STREET

GUELPH, ON

Title

PROPOSED STORM DRAINAGE CONDITIONS

Project No.
161413684

Scale
1:400
0 4 12 20m

Drawing No.
2

Sheet
2 of 2

Revision
0

V:\01614\active\161413684\design\drawing\report figures\swm\161413684_C-SD_prop.dwg
2020-3-24 3:44 PM by: Childs, Jason

ORIGINAL SHEET - ANSI D

HYDROLOGIC MODELLING PARAMETERS

1250 Gordon Street [161413684]
MIDUSS Parameters

Table 1: CN Values								Source
Land Use	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	
Meadow "Good"	30	44	58	65	71	75	78	USDA
Woodlot "Fair"	36	48	60	67	73	76	79	USDA
Lawns "Good"	39	50	61	68	74	77	80	USDA
Pasture/Range	49	55	60	70	79	82	84	USDA
Crop	64	70	74	79	81	84	85	USDA
Gravel	76	81	85	87	89	90	91	USDA
Bare Soil (Fallow)	77	82	86	89	91	93	94	USDA
Impervious	98	98	98	98	98	98	98	USDA

USDA - United States Department of Agriculture (2004), National Engineering Handbook, Part 630 Hydrology,

Table 2: Pre-Development Parameters

Area Description	**Catchment Number**	**Area (ha)**	**Flow Path Length (m)**	**CN**	**Runoff Coefficient (C)**	**Manning n - Pervious**	**Change in Elevation (m)**	**Slope (%)**	**Imperviousness (%)**	**Initial Abstraction - Pervious (mm)**
To Gordon Street	101	1.130	105.00	67	0.25	0.03	4.00	3.81	7	5.0
To Torrance Watershed	102	1.730	145.00	67	0.21	0.03	5.00	3.45	2	5.0
TOTAL AREA		**2.86**								

Table 3: Post-Development Parameters

Area Description	**Catchment Number**	**Area (ha)**	**Flow Path Length (m)**	**CN**	**Runoff Coefficient (C)**	**Manning n - Pervious**	**Change in Elevation (m)**	**Slope (%)**	**Imperviousness (%)**	**Initial Abstraction - Pervious (mm)**
Uncontrolled to Gordon	201	0.120	10.00	68	0.69	0.03		2.00	70	5.0
Building West	202	0.210	40.00	68	0.89	0.03		0.50	99	5.0
Building East	203	0.230	25.00	68	0.89	0.03		0.50	99	5.0
Parking	204	0.850	45.00	68	0.80	0.03		1.50	85	5.0
To Torrance	205	1.440	125.00	67	0.21	0.03	5.00	4.00	2	5.0
TOTAL AREA		**2.85**								

Notes:

Slope measure from topographic contours and pre-development drainage plan

Imperviousness estimated from development plan (existing buildings imperviouness estimated to be 99%)

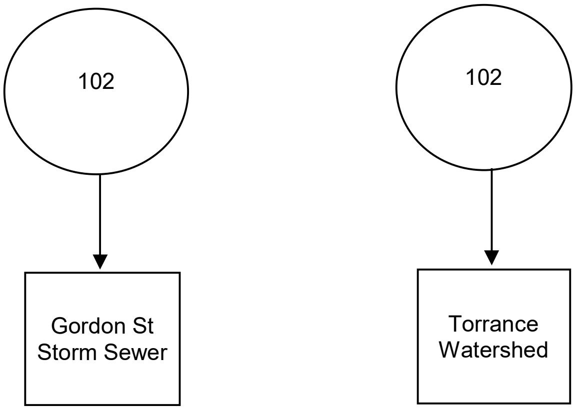
Manning n for parking lot surface taken as 0.010; 0.05 for brush areas; and 0.03 for lawn areas; from Manning n for Channels

R.C assumed to be 0.2 for undeveloped areas, 0.9 for impervious area, as per Design Chart 1.07 (MTO Drainage Management Manual)

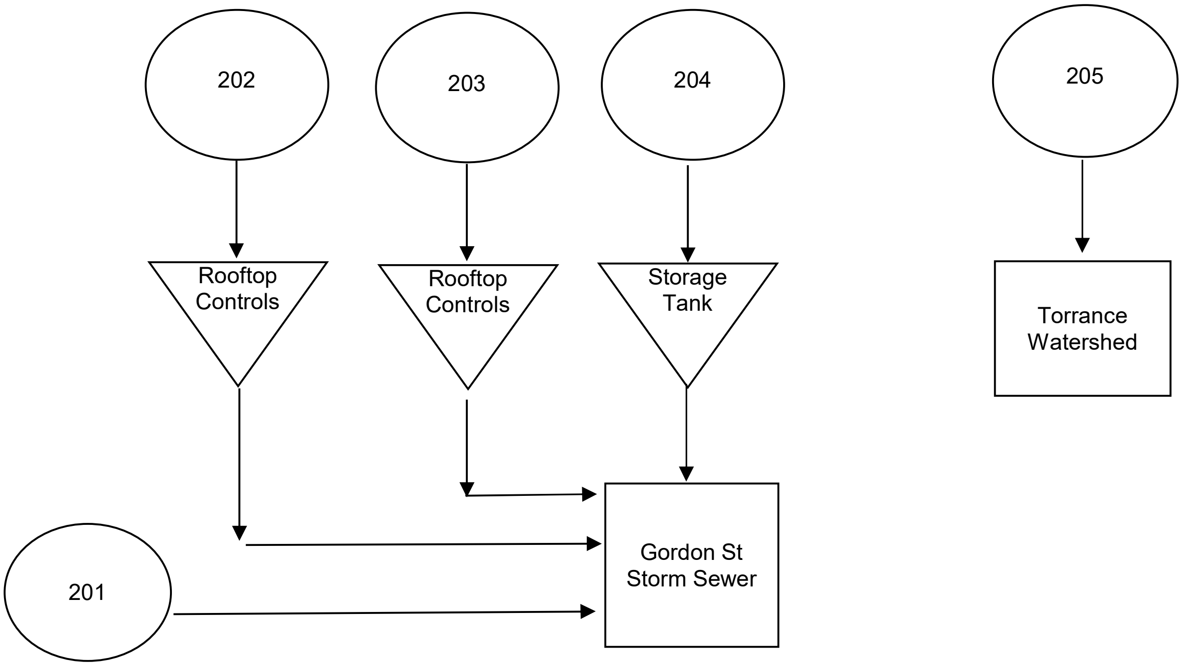
Assume graded areas have a slope of 1.5 - 2.0%

1250 Gordon Street [161413684]

Pre-Development Drainage Schematic



Post-Development Drainage Schematic



1250 Gordon Street [161413684]
SWM Storage Tank Stage-Storage-Discharge

West Building - Catchment 202	**Building Area**	**0.210**	**ha**
		2,100	**m^2**

	Rating Curve for MIDUSS					
	Elevation	Discharge	Active Storage	Active Storage	Drawdown (hrs)	
	(m)	(m^3/s)	(m^3)	(ha*m)	Increment	Total
Orifice Elev.	0.06	0.001	0	0.0000		
	0.08	0.002	42	0.0042	9.9	0.0
	0.10	0.002	84	0.0084	5.6	0.0
	0.12	0.003	126	0.0126	4.4	0.0
	0.14	0.003	168	0.0168	3.7	0.0
Top of Tank Elev.	0.16	0.004	210	0.0210	3.3	0.0

Volume Estimation			
	Total Pond		Total
Elevation	Area	Act Vol	Act Vol
(m)	(m^2)	(m^3)	(m^3)
0.00	2100	0.00	0
0.02	2100	42.00	42
0.04	2100	42.00	84
0.06	2100	42.00	126
0.08	2100	42.00	168
0.10	2100	42.00	210
0.12	2100	42.00	252
0.14	2100	42.00	294
0.16	2100	42.00	336

Outlet Controls				
Elevation	Orifice 1	Total Flow	Parameters	
(m)	(m^3/s)	(m^3/s)		
			Orifce 1 in Junction Box	
0.00			Orifice Invert Elev. (m)	Orifice Coeff.
0.02	0.000	0.000	0.02	0.60
0.04	0.000	0.000	Orifice Mid-point Elev. (m)	Perimeter (m)
0.06	0.001	0.001	0.06	0.24
0.08	0.002	0.002	Orifice Diam.(mm)	Area (m^2)
0.10	0.002	0.002	75	0.004
0.12	0.003	0.003	Weir Coeff. (semi-circular)	Orientation
0.14	0.003	0.003	1.62	Vertical
0.16	0.004	0.004		

East Building - Catchment 203	**Building Area**	**0.230**	**ha**
		2,300	**m^2**

	Rating Curve for MIDUSS					
	Elevation	Discharge	Active Storage	Active Storage	Drawdown (hrs)	
	(m)	(m^3/s)	(m^3)	(ha*m)	Increment	Total
Orifice Elev.	0.06	0.000	0	0.0000		
	0.08	0.000	46	0.0046	96.9	0.0
	0.10	0.001	92	0.0092	22.9	0.0
	0.12	0.002	138	0.0138	9.7	0.0
	0.14	0.003	184	0.0184	5.4	0.0
Top of Tank Elev.	0.16	0.004	230	0.0230	3.4	0.0

Volume Estimation			
	Total Pond		Total
Elevation	Area	Act Vol	Act Vol
(m)	(m^2)	(m^3)	(m^3)
0.00	2300	0.00	0
0.02	2300	46.00	46
0.04	2300	46.00	92
0.06	2300	46.00	138
0.08	2300	46.00	184
0.10	2300	46.00	230
0.12	2300	46.00	276
0.14	2300	46.00	322
0.16	2300	46.00	368

Outlet Controls				
Elevation	Orifice 1	Total Flow	Parameters	
(m)	(m^3/s)	(m^3/s)		
			Orifce 1 in Junction Box	
0.00			Orifice Invert Elev. (m)	Orifice Coeff.
0.02	0.000	0.000	0.02	0.60
0.04	#NUM!	#NUM!	Orifice Mid-point Elev. (m)	Perimeter (m)
0.06	0.000	0.000	0.06	0.24
0.08	0.000	0.000	Orifice Diam.(mm)	Area (m^2)
0.10	0.001	0.001	75	0.004
0.12	0.002	0.002	Weir Coeff. (semi-circular)	Orientation
0.14	0.003	0.003	1.62	Vertical
0.16	0.004	0.004		

Storage Tank

	Rating Curve for MIDUSS					
	Elevation	Discharge	Active Storage	Active Storage	Drawdown (hrs)	
	(m)	(m^3/s)	(m^3)	(ha*m)	Increment	Total
Orifice Elev.	339.00	0.000	0	0.0000		
	339.25	0.005	88	0.0088	9.0	9.0
	339.50	0.008	175	0.0175	3.6	12.6
	339.75	0.010	263	0.0263	2.7	15.3
	340.00	0.012	350	0.0350	2.3	17.6
Top of Tank Elev.	340.00	0.013	438	0.0438	2.0	19.6

Volume Estimation			
	Total Pond		Total
Elevation	Area	Act Vol	Act Vol
(m)	(m^2)	(m^3)	(m^3)
339.00	350	87.50	88
339.25	350	87.50	175
339.50	350	87.50	263
339.75	350	87.50	350
340.00	350	87.50	438
340.25	350	87.50	525

Outlet Controls				
Elevation	Orifice 1	Total Flow	Parameters	
(m)	(m^3/s)	(m^3/s)		
			Orifce 1 in Junction Box	
			Orifice Invert Elev. (m)	Orifice Coeff.
			339.00	0.60
			Orifice Mid-point Elev. (m)	Perimeter (m)
339.00	0.000	0.000	339.04	0.24
339.25	0.005	0.005	Orifice Diam.(mm)	Area (m^2)
339.50	0.008	0.008	75	0.004
339.75	0.010	0.010	Weir Coeff. (semi-circular)	Orientation
340.00	0.012	0.012	1.62	Vertical
340.25	0.013	0.013		

MIDUSS MODELING FILES

```
       Output File (4.7) 2yr_ULT.out  opened 2006-11-07  16:08
       Units used are defined by G =    9.810
          360   720     15.000        are MAXDT MAXHYD & DTMIN values
       Licensee: Paragon Engineering Limited
35     COMMENT
      5     line(s) of comment
       ********************************
       1250 Gordon Street - 1614-13684
       Stormwater Management Modelling
       March 2020 - C. Phelps
       ********************************
35     COMMENT
      7     line(s) of comment
       *********************


       2-yr STORM


       *********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
     743.000     Coefficient  a
       6.000     Constant  b    (min)
        .799     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
               25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************
       To Gordon Street
       *********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .025       .025       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************
       To Torrance Watershed
       *********************

 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
       0.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       *********************


       5-yr STORM


       *********************
14     START
      1     1=Zero; 2=Define
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
```

```
    1593.000     Coefficient  a
      11.000     Constant  b    (min)
        .879     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
               25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
35     COMMENT
      3     line(s) of comment
       *********************
       To Gordon Street
       *********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total

15     ADD RUNOFF
              .025       .025       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************
       To Torrance Watershed
       *********************

 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
```

```
       0.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       *********************


       10-yr STORM


       *********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    2221.000     Coefficient  a
      12.000     Constant  b    (min)
        .908     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
               25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************
       To Gordon Street
       *********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
```

```
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       To Torrance Watershed
       **********************

 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
       0.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       **********************


       25-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3158.000     Coefficient  a
```

```
      15.000     Constant  b    (min)
        .936     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
                25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       To Gordon Street
       **********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       To Torrance Watershed
       **********************

 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       7.000     Per cent Impervious
```

```
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .025       .025       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       **********************


       50-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3886.000     Coefficient  a
      16.000     Constant  b    (min)
        .949     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
                25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       To Gordon Street
       **********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
```

```
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       To Torrance Watershed
       **********************

 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
       0.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       **********************


       100-yr STORM


       **********************
14     START
      1     1=Zero; 2=Define
 2     STORM
```

```
         1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
  4688.000     Coefficient  a
    17.000     Constant  b    (min)
      .962     Exponent  c
      .400     Fraction to peak  r
   180.000     Duration ó 1500 min
              25.003 mm     Total depth
 3     IMPERVIOUS
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .015     Manning "n"
    98.000     SCS Curve No or C
      .100     Ia/S Coefficient
     1.500     Initial Abstraction
35     COMMENT
     3     line(s) of comment
       *********************
       To Gordon Street
       *********************
 4     CATCHMENT
   101.000     ID No.ó 99999
     1.130     Area in hectares
   104.000     Length (PERV) metres
     3.800     Gradient (%)
     7.000     Per cent Impervious
     1.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    67.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
       *********************
       To Torrance Watershed
       *********************

 4     CATCHMENT
   102.000     ID No.ó 99999
     1.730     Area in hectares
   145.000     Length (PERV) metres
```

```
     3.500     Gradient (%)
     2.000     Per cent Impervious
     0.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    67.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .346       .346       .000       .000 c.m/s
20     MANUAL
```

```
       Output File (4.7) GORPRE.out   opened 2020-03-26  15:01
       Units used are defined by G =    9.810
          300   600    15.000        are MAXDT MAXHYD & DTMIN values
       Licensee: Paragon Engineering Limited
35     COMMENT
     5     line(s) of comment
       ********************************
       1250 Gordon Street - 1614-13684
       Stormwater Management Modelling
       March 2020 - C. Phelps
       ********************************
35     COMMENT
     7     line(s) of comment
       *********************


       2-yr STORM


       *********************
 2     STORM
         1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
   743.000     Coefficient  a
     6.000     Constant  b    (min)
      .799     Exponent  c
      .400     Fraction to peak  r
   180.000     Duration ó 4500 min
              34.242 mm     Total depth
 3     IMPERVIOUS
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .010     Manning "n"
    98.000     SCS Curve No or C
      .100     Ia/S Coefficient
     1.500     Initial Abstraction
14     START
     1     1=Zero; 2=Define
35     COMMENT
     3     line(s) of comment
       *********************
       To Gordon Street
       *********************
 4     CATCHMENT
   101.000     ID No.ó 99999
     1.130     Area in hectares
   104.000     Length (PERV) metres
     3.800     Gradient (%)
     7.000     Per cent Impervious
     1.000     Length (IMPERV)
```

```
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    67.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .008       .000       .000       .000 c.m/s
              .009       .163       .020     C perv/imperv/total
15     ADD RUNOFF
              .008       .008       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
       *********************
       To Torrance Watershed
       *********************
 4     CATCHMENT
   102.000     ID No.ó 99999
     1.730     Area in hectares
   145.000     Length (PERV) metres
     3.500     Gradient (%)
     2.000     Per cent Impervious
      .000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    67.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .003       .008       .000       .000 c.m/s
              .009       .171       .012     C perv/imperv/total
15     ADD RUNOFF
              .003       .011       .000       .000 c.m/s
35     COMMENT
     7     line(s) of comment
       *********************


       5-yr STORM


       *********************
14     START
     1     1=Zero; 2=Define
 2     STORM
         1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
  1593.000     Coefficient  a
```

```
      11.000     Constant  b    (min)
        .879     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
              47.219 mm     Total depth
  3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
 35     COMMENT
      3     line(s) of comment
        *********************
        To Gordon Street
        *********************
  4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .013       .000       .000       .000 c.m/s
               .018       .190       .030     C perv/imperv/total
 15     ADD RUNOFF
               .013       .013       .000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        *********************
        To Torrance Watershed
        *********************
  4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
        .000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
```

```
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .006       .013       .000       .000 c.m/s
               .018       .199       .022     C perv/imperv/total
 15     ADD RUNOFF
               .006       .019       .000       .000 c.m/s
 35     COMMENT
      7     line(s) of comment
        *********************


        10-yr STORM


        *********************
  2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    2221.000     Coefficient  a
      12.000     Constant  b    (min)
        .908     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
              56.266 mm     Total depth
  3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        *********************
        To Gordon Street
        *********************
  4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
```

```
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .017       .000       .000       .000 c.m/s
               .024       .203       .037     C perv/imperv/total
 15     ADD RUNOFF
               .017       .017       .000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        *********************
        To Torrance Watershed
        *********************
  4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
        .000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .010       .017       .000       .000 c.m/s
               .024       .212       .028     C perv/imperv/total
 15     ADD RUNOFF
               .010       .026       .000       .000 c.m/s
 35     COMMENT
      7     line(s) of comment
        *********************


        25-yr STORM


        *********************
  2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3158.000     Coefficient  a
      15.000     Constant  b    (min)
        .936     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
```

```
              68.057 mm     Total depth
  3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        *********************
        To Gordon Street
        *********************
  4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .023       .000       .000       .000 c.m/s
               .032       .215       .045     C perv/imperv/total
 15     ADD RUNOFF
               .023       .023       .000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        *********************
        To Torrance Watershed
        *********************
  4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       7.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
```

```
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .032       .023       .000       .000 c.m/s
              .032       .237       .047     C perv/imperv/total
15     ADD RUNOFF
              .032       .055       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       **********************


       50-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3886.000     Coefficient  a
      16.000     Constant  b    (min)
        .949     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
             77.819 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       To Gordon Street
       **********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
```

```
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .028       .000       .000       .000 c.m/s
              .038       .223       .051     C perv/imperv/total
15     ADD RUNOFF
              .028       .028       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       To Torrance Watershed
       **********************
 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
        .000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .029       .028       .000       .000 c.m/s
              .038       .233       .042     C perv/imperv/total
15     ADD RUNOFF
              .029       .051       .000       .000 c.m/s
35     COMMENT
      7     line(s) of comment
       **********************


       100-yr STORM


       **********************
14     START
      1     1=Zero; 2=Define
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    4688.000     Coefficient  a
      17.000     Constant  b    (min)
        .962     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
```

```
             87.226 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .015     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
35     COMMENT
      3     line(s) of comment
       **********************
       To Gordon Street
       **********************
 4     CATCHMENT
     101.000     ID No.ó 99999
       1.130     Area in hectares
     104.000     Length (PERV) metres
       3.800     Gradient (%)
       7.000     Per cent Impervious
       1.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .034       .000       .000       .000 c.m/s
              .044       .229       .057     C perv/imperv/total
15     ADD RUNOFF
              .034       .034       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       To Torrance Watershed
       **********************
 4     CATCHMENT
     102.000     ID No.ó 99999
       1.730     Area in hectares
     145.000     Length (PERV) metres
       3.500     Gradient (%)
       2.000     Per cent Impervious
        .000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
```

```
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .040       .034       .000       .000 c.m/s
              .044       .239       .048     C perv/imperv/total
15     ADD RUNOFF
              .040       .071       .000       .000 c.m/s
20     MANUAL
```

```
       Output File (4.7) 2yr_ULT.out  opened 2006-11-07  16:08
       Units used are defined by G =    9.810
          360   720     15.000        are MAXDT MAXHYD & DTMIN values
       Licensee: Paragon Engineering Limited
35     COMMENT
      5     line(s) of comment
       *******************************
       1250 Gordon Street - 1614-13884
       Stormwater Management Modelling
       March 2020 - C. Phelps
       *******************************
14     START
      1     1=Zero; 2=Defin
35     COMMENT
      7     line(s) of comment
       **********************


       2-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
     743.000     Coefficient  a
       6.000     Constant  b    (min)
        .799     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
              25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street

       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
       0.120     Area in hectares
       1.000     Length (PERV) metres
```

```
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .000       .000       .000       .000 c.m/s
17     COMBINE
   500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************

 4     CATCHMENT
     202.000     ID No.ó 99999
       0.210     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
```

```
             .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
             .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ********************************
       West Building - Rooftop Control
       ********************************
10     POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.080      .0020         42.0
         0.120     0.0030        126.0
         0.160     0.0040        210.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
             .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************

       West Roof-top Flow to Gordon St. Storm Sewer

       *********************************************
17     COMBINE
   500     Junction Node No.
            0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************

 4     CATCHMENT
     203.000     ID No.ó 99999
       0.230     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
```

```
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ********************************
       East Building - Rooftop Control
       ********************************
10     POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.100      .0010         92.0
         0.120     0.0020        138.0
         0.160     0.0040        230.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************

       East Roof-top Flow to Gordon St. Storm Sewer

       *********************************************
17     COMBINE
   500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************
       Parking Area Catchment
       *********************

 4     CATCHMENT
     204.000     ID No.ó 99999
       0.850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
```

```
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************
       Parking Lot Ponding
       *********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000      .00000          .0
        42.300     0.1730        114.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
17     COMBINE
    400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
18     CONFLUENCE
    400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **************************
       Underground Storage Tank
       **************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000      .00000          .0
       339.250     0.0050         88.0
       340.000     0.0120        350.0
       340.250     0.0130        438.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *************************************

       Total Flow to Gordon St. Storm Sewer
```

```
       ************************************
17     COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
18     CONFLUENCE
    500     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************************************

       Undeveloped Area - Flow to Torrance Watershed

       *********************************************

 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Defin
35     COMMENT
      7     line(s) of comment
       *********************


       5-yr STORM


       *********************
 2     STORM
```

```
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    1593.000     Coefficient  a
      11.000     Constant  b    (min)
        .879     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
              25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street

       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
       0.120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .000       .000       .000       .000 c.m/s
17     COMBINE
```

```
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************

 4     CATCHMENT
     202.000     ID No.ó 99999
       0.210     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.080      .0020         42.0
         0.120     0.0030        126.0
         0.160     0.0040        210.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************

       West Roof-top Flow to Gordon St. Storm Sewer
```

```
       *********************************************
17     COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***************************
       East Building - Roof Area
       ***************************

 4     CATCHMENT
     203.000     ID No.ó 99999
       0.230     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ********************************
       East Building - Rooftop Control
       ********************************
10     POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.100      .0010         92.0
         0.120     0.0020        138.0
         0.160     0.0040        230.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
```

```
       *********************************************

       East Roof-top Flow to Gordon St. Storm Sewer

       *********************************************
17     COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************
       Parking Area Catchment
       *********************

 4     CATCHMENT
     204.000     ID No.ó 99999
       0.850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************
       Parking Lot Ponding
       *********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000      .00000          .0
        42.300     0.1730        114.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
17     COMBINE
```

```
    400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
18     CONFLUENCE
    400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **************************
       Underground Storage Tank
       **************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000      .00000          .0
       339.250     0.0050         88.0
       340.000     0.0120        350.0
       340.250     0.0130        438.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *************************************

       Total Flow to Gordon St. Storm Sewer

       ************************************
17     COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
18     CONFLUENCE
    500     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************************************

       Undeveloped Area - Flow to Torrance Watershed

       *********************************************

 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
```

```
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Defin
35     COMMENT
      7     line(s) of comment
       *********************


       10-yr STORM


       *********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    2221.000     Coefficient  a
      12.000     Constant  b    (min)
        .908     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
                25.003 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************************
       Uncontrolled Flow to Gordon Street

       **********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
```

```
       0.120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .000       .000       .000       .000 c.m/s
17     COMBINE
   500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************

 4     CATCHMENT
     202.000     ID No.ó 99999
       0.210     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
```

```
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
        0.000      .00000          .0
        0.080      .0020         42.0
        0.120     0.0030        126.0
        0.160     0.0040        210.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************

       West Roof-top Flow to Gordon St. Storm Sewer

       *********************************************
17     COMBINE
   500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************

 4     CATCHMENT
     203.000     ID No.ó 99999
       0.230     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
```

```
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
        0.000      .00000          .0
        0.100      .0010         92.0
        0.120     0.0020        138.0
        0.160     0.0040        230.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************************************

       East Roof-top Flow to Gordon St. Storm Sewer

       **********************************************
17     COMBINE
   500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************

 4     CATCHMENT
     204.000     ID No.ó 99999
       0.850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Lot Ponding
       **********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000      .00000          .0
        42.300     0.1730        114.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
17     COMBINE
   400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
18     CONFLUENCE
   400     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000      .00000          .0
       339.250     0.0050         88.0
       340.000     0.0120        350.0
       340.250     0.0130        438.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **************************************
```

```
       Total Flow to Gordon St. Storm Sewer

       ************************************
 17    COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
 18    CONFLUENCE
    500     Junction Node No.
             0.000      0.000      0.000       .000 c.m/s
 14    START
      1     1=Zero; 2=Define
 35    COMMENT
      3     line(s) of comment
       **********************************************

       Undeveloped Area - Flow to Torrance Watershed

       **********************************************

  4    CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
 15    ADD RUNOFF
              .000       .000       .000       .000 c.m/s
14    START
      1     1=Zero; 2=Defin
 35    COMMENT
      7     line(s) of comment
       **********************


       25-yr STORM
```

```
       **********************
  2    STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3158.000     Coefficient  a
      15.000     Constant  b    (min)
        .935     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 1500 min
              25.003 mm     Total depth
  3    IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street

       ***********************************
  4    CATCHMENT
     201.000     ID No.ó 99999
       0.120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .025       .000       .000       .000 c.m/s
              .093       .794       .107     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
  9    ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
```

```
              .000       .000       .000       .000 c.m/s
 17    COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
 14    START
      1     1=Zero; 2=Define
 35    COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************

  4    CATCHMENT
     202.000     ID No.ó 99999
       0.210     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
 15    ADD RUNOFF
              .000       .000       .000       .000 c.m/s
 35    COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
 10    POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.080      .0020         42.0
         0.120     0.0030        126.0
         0.160     0.0040        210.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
 35    COMMENT
      3     line(s) of comment
       *********************************************
```

```
       West Roof-top Flow to Gordon St. Storm Sewer

       *********************************************
17     COMBINE
    500     Junction Node No.
             0.000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************

  4    CATCHMENT
     203.000     ID No.ó 99999
       0.230     Area in hectares
       1.000     Length (PERV) metres
       0.500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
         0.000      .00000          .0
         0.100      .0010         92.0
         0.120     0.0020        138.0
         0.160     0.0040        230.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
              .000       .000       .000       .000 c.m/s
```

```
 35     COMMENT
      3     line(s) of comment
        ********************************************

        East Roof-top Flow to Gordon St. Storm Sewer

        ********************************************
 17     COMBINE
    500     Junction Node No.
              0.000       .000       .000       .000 c.m/s
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        *********************
        Parking Area Catchment
        *********************

  4     CATCHMENT
      204.000     ID No.ó 99999
        0.850     Area in hectares
        1.000     Length (PERV) metres
        1.500     Gradient (%)
       85.000     Per cent Impervious
       60.000     Length (IMPERV)
         .000     %Imp. with Zero Dpth
            1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
         .030     Manning "n"
       68.000     SCS Curve No or C
         .100     Ia/S Coefficient
        5.000     Initial Abstraction
            1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .346       .000       .000       .000 c.m/s
               .146       .799       .472     C perv/imperv/total
 15     ADD RUNOFF
               .000       .000       .000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        *********************
        Parking Lot Ponding
        *********************
 10     POND
      2 Depth - Discharge - Volume sets
         42.000      .00000          .0
         42.300     0.1730        114.0
        Peak Outflow    =     0.000 c.m/s
        Maximum Depth   =   000.000 metres
        Maximum Storage =     0000. c.m
```

```
               .000       .000       .000       .000 c.m/s
 17     COMBINE
    400     Junction Node No.
              0.000      0.000      0.000       .000 c.m/s
 18     CONFLUENCE
    400     Junction Node No.
              0.000      0.000      0.000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        ***************************
        Underground Storage Tank
        ***************************
 10     POND
      4 Depth - Discharge - Volume sets
        339.000      .00000          .0
        339.250     0.0050         88.0
        340.000     0.0120        350.0
        340.250     0.0130        438.0
        Peak Outflow    =     0.000 c.m/s
        Maximum Depth   =   000.000 metres
        Maximum Storage =     0000. c.m
               .000       .000       .000       .000 c.m/s
 35     COMMENT
      3     line(s) of comment
        *************************************

        Total Flow to Gordon St. Storm Sewer

        ***********************************
 17     COMBINE
    500     Junction Node No.
              0.000       .000       .000       .000 c.m/s
 18     CONFLUENCE
    500     Junction Node No.
              0.000      0.000      0.000       .000 c.m/s
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        *********************************************

        Undeveloped Area - Flow to Torrance Watershed

        *********************************************

  4     CATCHMENT
      205.000     ID No.ó 99999
        1.440     Area in hectares
```

```
      120.000     Length (PERV) metres
        4.000     Gradient (%)
        2.000     Per cent Impervious
        5.000     Length (IMPERV)
         .000     %Imp. with Zero Dpth
            1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
         .030     Manning "n"
       67.000     SCS Curve No or C
         .100     Ia/S Coefficient
        5.000     Initial Abstraction
            1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .346       .000       .000       .000 c.m/s
               .146       .799       .472     C perv/imperv/total
 15     ADD RUNOFF
               .000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Defin
 35     COMMENT
      7     line(s) of comment
        *********************


        50-yr STORM


        *********************
  2     STORM
            1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
     3886.000     Coefficient  a
       16.000     Constant  b    (min)
         .949     Exponent  c
         .400     Fraction to peak  r
      180.000     Duration ó 1500 min
               25.003 mm     Total depth
  3     IMPERVIOUS
            1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
         .010     Manning "n"
       98.000     SCS Curve No or C
         .100     Ia/S Coefficient
        1.500     Initial Abstraction
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        ***********************************
        Uncontrolled Flow to Gordon Street

        ***********************************
```

```
  4     CATCHMENT
      201.000     ID No.ó 99999
        0.120     Area in hectares
        1.000     Length (PERV) metres
        2.000     Gradient (%)
       70.000     Per cent Impervious
       10.000     Length (IMPERV)
         .000     %Imp. with Zero Dpth
            1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
         .030     Manning "n"
       68.000     SCS Curve No or C
         .100     Ia/S Coefficient
        5.000     Initial Abstraction
            1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
               .025       .000       .000       .000 c.m/s
               .093       .794       .107     C perv/imperv/total
 15     ADD RUNOFF
               .000       .000       .000       .000 c.m/s
  9     ROUTE
         .000     Conduit Length
         .000     No Conduit defined
         .000     Zero lag
         .000     Beta weighting factor
         .000     Routing timestep
            0     No. of sub-reaches
               .000       .000       .000       .000 c.m/s
 17     COMBINE
    500     Junction Node No.
              0.000       .000       .000       .000 c.m/s
 14     START
      1     1=Zero; 2=Define
 35     COMMENT
      3     line(s) of comment
        ****************************
        West Building - Roof Area
        ****************************

  4     CATCHMENT
      202.000     ID No.ó 99999
        0.210     Area in hectares
        1.000     Length (PERV) metres
        0.500     Gradient (%)
       99.000     Per cent Impervious
       40.000     Length (IMPERV)
         .000     %Imp. with Zero Dpth
            1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
         .030     Manning "n"
       68.000     SCS Curve No or C
```

```
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
         1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
           .346       .000       .000       .000 c.m/s
           .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
           .000       .000       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      *********************************
      West Building - Rooftop Control
      *********************************
10     POND
     4 Depth - Discharge - Volume sets
       0.000      .00000          .0
       0.080      .0020         42.0
       0.120     0.0030        126.0
       0.160     0.0040        210.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
           .000       .000       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      *********************************************

      West Roof-top Flow to Gordon St. Storm Sewer

      *********************************************
17     COMBINE
   500     Junction Node No.
          0.000       .000       .000       .000 c.m/s
14     START
     1     1=Zero; 2=Define
35     COMMENT
     3     line(s) of comment
      ****************************
      East Building - Roof Area
      ****************************

 4     CATCHMENT
    203.000     ID No.ó 99999
      0.230     Area in hectares
      1.000     Length (PERV) metres
      0.500     Gradient (%)
     99.000     Per cent Impervious
     25.000     Length (IMPERV)
       .000     %Imp. with Zero Dpth
```

```
         1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .030     Manning "n"
     68.000     SCS Curve No or C
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
         1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
           .346       .000       .000       .000 c.m/s
           .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
           .000       .000       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      *********************************
      East Building - Rooftop Control
      *********************************
10     POND
     4 Depth - Discharge - Volume sets
       0.000      .00000          .0
       0.100      .0010         92.0
       0.120     0.0020        138.0
       0.160     0.0040        230.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
           .000       .000       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      *********************************************

      East Roof-top Flow to Gordon St. Storm Sewer

      *********************************************
17     COMBINE
   500     Junction Node No.
          0.000       .000       .000       .000 c.m/s
14     START
     1     1=Zero; 2=Define
35     COMMENT
     3     line(s) of comment
      **********************
      Parking Area Catchment
      **********************

 4     CATCHMENT
    204.000     ID No.ó 99999
      0.850     Area in hectares
      1.000     Length (PERV) metres
      1.500     Gradient (%)
```

```
     85.000     Per cent Impervious
     60.000     Length (IMPERV)
       .000     %Imp. with Zero Dpth
         1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .030     Manning "n"
     68.000     SCS Curve No or C
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
         1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
           .346       .000       .000       .000 c.m/s
           .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
           .000       .000       .000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      **********************
      Parking Lot Ponding
      **********************
10     POND
     2 Depth - Discharge - Volume sets
      42.000      .00000          .0
      42.300     0.1730        114.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
           .000       .000       .000       .000 c.m/s
17     COMBINE
   400     Junction Node No.
          0.000      0.000      0.000       .000 c.m/s
18     CONFLUENCE
   400     Junction Node No.
          0.000      0.000      0.000       .000 c.m/s
35     COMMENT
     3     line(s) of comment
      ***************************
      Underground Storage Tank
      ***************************
10     POND
     4 Depth - Discharge - Volume sets
      339.000      .00000          .0
      339.250     0.0050         88.0
      340.000     0.0120        350.0
      340.250     0.0130        438.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
           .000       .000       .000       .000 c.m/s
35     COMMENT
```

```
     3     line(s) of comment
      *************************************

      Total Flow to Gordon St. Storm Sewer

      ***********************************
17     COMBINE
   500     Junction Node No.
          0.000       .000       .000       .000 c.m/s
18     CONFLUENCE
   500     Junction Node No.
          0.000      0.000      0.000       .000 c.m/s
14     START
     1     1=Zero; 2=Define
35     COMMENT
     3     line(s) of comment
      *********************************************

      Undeveloped Area - Flow to Torrance Watershed

      *********************************************
 4     CATCHMENT
    205.000     ID No.ó 99999
      1.440     Area in hectares
    120.000     Length (PERV) metres
      4.000     Gradient (%)
      2.000     Per cent Impervious
      5.000     Length (IMPERV)
       .000     %Imp. with Zero Dpth
         1      Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .030     Manning "n"
     67.000     SCS Curve No or C
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
         1      Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
           .346       .000       .000       .000 c.m/s
           .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
           .000       .000       .000       .000 c.m/s
14     START
     1     1=Zero; 2=Defin
35     COMMENT
     7     line(s) of comment
      *********************


      100-yr STORM
```

```
      **********************
 2    STORM
         1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
  4688.000     Coefficient  a
    17.000     Constant  b    (min)
      .962     Exponent  c
      .400     Fraction to peak  r
   180.000     Duration ó 1500 min
           25.003 mm     Total depth
 3    IMPERVIOUS
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .010     Manning "n"
    98.000     SCS Curve No or C
      .100     Ia/S Coefficient
     1.500     Initial Abstraction
35    COMMENT
     3     line(s) of comment
      ***********************************
      Uncontrolled Flow to Gordon Street

      ***********************************
 4    CATCHMENT
   201.000     ID No.ó 99999
     0.120     Area in hectares
     1.000     Length (PERV) metres
     2.000     Gradient (%)
    70.000     Per cent Impervious
    10.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .025       .000       .000       .000 c.m/s
            .093       .794       .107     C perv/imperv/total
15    ADD RUNOFF
            .000       .000       .000       .000 c.m/s
 9    ROUTE
      .000     Conduit Length
      .000     No Conduit defined
      .000     Zero lag
      .000     Beta weighting factor
      .000     Routing timestep
         0     No. of sub-reaches
```

```
            .000       .000       .000       .000 c.m/s
17    COMBINE
   500     Junction Node No.
           0.000       .000       .000       .000 c.m/s
14    START
     1     1=Zero; 2=Define
35    COMMENT
     3     line(s) of comment
      ****************************
      West Building - Roof Area
      ****************************

 4    CATCHMENT
   202.000     ID No.ó 99999
     0.210     Area in hectares
     1.000     Length (PERV) metres
     0.500     Gradient (%)
    99.000     Per cent Impervious
    40.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .346       .000       .000       .000 c.m/s
            .146       .799       .472     C perv/imperv/total
15    ADD RUNOFF
            .000       .000       .000       .000 c.m/s
35    COMMENT
     3     line(s) of comment
      *********************************
      West Building - Rooftop Control
      *********************************
10    POND
     4 Depth - Discharge - Volume sets
        0.000      .00000          .0
        0.080      .0020         42.0
        0.120     0.0030        126.0
        0.160     0.0040        210.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
            .000       .000       .000       .000 c.m/s
35    COMMENT
     3     line(s) of comment
      *********************************************
```

```
      West Roof-top Flow to Gordon St. Storm Sewer

      *********************************************
17    COMBINE
   500     Junction Node No.
           0.000       .000       .000       .000 c.m/s
14    START
     1     1=Zero; 2=Define
35    COMMENT
     3     line(s) of comment
      ****************************
      East Building - Roof Area
      ****************************

 4    CATCHMENT
   203.000     ID No.ó 99999
     0.230     Area in hectares
     1.000     Length (PERV) metres
     0.500     Gradient (%)
    99.000     Per cent Impervious
    25.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .346       .000       .000       .000 c.m/s
            .146       .799       .472     C perv/imperv/total
15    ADD RUNOFF
            .000       .000       .000       .000 c.m/s
35    COMMENT
     3     line(s) of comment
      *********************************
      East Building - Rooftop Control
      *********************************
10    POND
     4 Depth - Discharge - Volume sets
        0.000      .00000          .0
        0.100      .0010         92.0
        0.120     0.0020        138.0
        0.160     0.0040        230.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
            .000       .000       .000       .000 c.m/s
```

```
35    COMMENT
     3     line(s) of comment
      **********************************************

      East Roof-top Flow to Gordon St. Storm Sewer

      **********************************************
17    COMBINE
   500     Junction Node No.
           0.000       .000       .000       .000 c.m/s
14    START
     1     1=Zero; 2=Define
35    COMMENT
     3     line(s) of comment
      **********************
      Parking area Catchment
      **********************

 4    CATCHMENT
   204.000     ID No.ó 99999
     0.850     Area in hectares
     1.000     Length (PERV) metres
     1.500     Gradient (%)
    85.000     Per cent Impervious
    60.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .346       .000       .000       .000 c.m/s
            .146       .799       .472     C perv/imperv/total
15    ADD RUNOFF
            .000       .000       .000       .000 c.m/s
35    COMMENT
     3     line(s) of comment
      **********************
      Parking Lot Ponding
      **********************
10    POND
     2 Depth - Discharge - Volume sets
       42.000      .00000          .0
       42.300     0.1730        114.0
      Peak Outflow    =     0.000 c.m/s
      Maximum Depth   =   000.000 metres
      Maximum Storage =     0000. c.m
```

```
            .000       .000       .000       .000 c.m/s
17     COMBINE
   400     Junction Node No.
           0.000      0.000      0.000       .000 c.m/s
18     CONFLUENCE
   400     Junction Node No.
           0.000      0.000      0.000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **************************
       Underground Storage Tank
       **************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000      .00000          .0
       339.250     0.0050         94.0
       340.000     0.0120        350.0
       340.250     0.0130        438.0
       Peak Outflow    =     0.000 c.m/s
       Maximum Depth   =   000.000 metres
       Maximum Storage =     0000. c.m
            .000       .000       .000       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *************************************

       Total Flow to Gordon St. Storm Sewer

       ***********************************
17     COMBINE
   500     Junction Node No.
           0.000       .000       .000       .000 c.m/s
18     CONFLUENCE
   500     Junction Node No.
           0.000      0.000      0.000       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       *********************************************

       Undeveloped Area - Flow to Torrance Watershed

       *********************************************

4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
```

```
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .346       .000       .000       .000 c.m/s
              .146       .799       .472     C perv/imperv/total
15     ADD RUNOFF
              .000       .000       .000       .000 c.m/s
14     START
      1     1=Zero; 2=Defin
20     MANUAL
```

```
       Output File (4.7) GORPOST.out  opened 2020-03-27  11:30
       Units used are defined by G =    9.810
          300   600    15.000        are MAXDT MAXHYD & DTMIN values
       Licensee: Paragon Engineering Limited
35     COMMENT
      5     line(s) of comment
       *******************************
       1250 Gordon Street - 1614-13884
       Stormwater Management Modelling
       March 2020 - C. Phelps
       *******************************
14     START
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       2-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
     743.000     Coefficient  a
       6.000     Constant  b    (min)
        .799     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
              34.242 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Streeet
       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
        .120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
```

```
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .007       .000       .000       .000 c.m/s
              .009       .185       .132     C perv/imperv/total
15     ADD RUNOFF
              .007       .007       .000       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .007       .007       .007       .000 c.m/s
17     COMBINE
   500     Junction Node No.
              .007       .007       .007       .007 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
     202.000     ID No.ó 99999
        .210     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .014       .000       .007       .007 c.m/s
              .009       .188       .186     C perv/imperv/total
15     ADD RUNOFF
```

```
              .014       .014       .007       .007 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .080      .00200        42.0
          .120      .00300       126.0
          .160      .00400       210.0
       Peak Outflow    =      .001 c.m/s
       Maximum Depth   =      .057 metres
       Maximum Storage =       30. c.m
              .014       .014       .001       .007 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
    500     Junction Node No.
              .014       .014       .001       .007 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
     203.000     ID No.ó 99999
        .230     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .015       .000       .001       .007 c.m/s
              .009       .185       .183     C perv/imperv/total
15     ADD RUNOFF
```

```
              .015       .015       .001       .007 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .100      .00100        92.0
          .120      .00200       138.0
          .160      .00400       230.0
       Peak Outflow    =      .000 c.m/s
       Maximum Depth   =      .043 metres
       Maximum Storage =       40. c.m
              .015       .015       .000       .007 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
    500     Junction Node No.
              .015       .015       .000       .007 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************
 4     CATCHMENT
     204.000     ID No.ó 99999
        .850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .048       .000       .000       .007 c.m/s
              .009       .187       .160     C perv/imperv/total
15     ADD RUNOFF
```

```
              .048       .048       .000       .007 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Lot Ponding
       **********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000        .000          .0
        42.300        .173       114.0
       Peak Outflow    =      .035 c.m/s
       Maximum Depth   =    42.061 metres
       Maximum Storage =       23. c.m
              .048       .048       .035       .007 c.m/s
17     COMBINE
    400     Junction Node No.
              .048       .048       .035       .035 c.m/s
18     CONFLUENCE
    400     Junction Node No.
              .048       .035       .035       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        88.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .005 c.m/s
       Maximum Depth   =   339.284 metres
       Maximum Storage =      100. c.m
              .048       .035       .005       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       **************************************
       Total Flow to Gordon St. Storm Sewer
       *************************************
17     COMBINE
    500     Junction Node No.
              .048       .035       .005       .007 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .048       .007       .005       .000 c.m/s
14     START
      1     1=Zero; 2=Define
```

```
35     COMMENT
      3     line(s) of comment
       *********************************************
       Undeveloped Area - Flow to Torrance Watershed
       *********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .003       .000       .005       .000 c.m/s
              .009       .175       .012     C perv/imperv/total
15     ADD RUNOFF
              .003       .003       .005       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       5-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    1593.000     Coefficient  a
      11.000     Constant  b    (min)
        .879     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
                47.219 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
```

```
14     START
   1     1=Zero; 2=Define
35     COMMENT
   3     line(s) of comment
       **********************************
       Uncontrolled Flow to Gordon Street
       **********************************
 4     CATCHMENT
   201.000     ID No.ó 99999
      .120     Area in hectares
     1.000     Length (PERV) metres
     2.000     Gradient (%)
    70.000     Per cent Impervious
    10.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .012       .000       .005       .000 c.m/s
            .018       .212       .154     C perv/imperv/total
15     ADD RUNOFF
            .012       .012       .005       .000 c.m/s
 9     ROUTE
      .000     Conduit Length
      .000     No Conduit defined
      .000     Zero lag
      .000     Beta weighting factor
      .000     Routing timestep
         0     No. of sub-reaches
            .012       .012       .012       .000 c.m/s
17     COMBINE
  500     Junction Node No.
            .012       .012       .012       .012 c.m/s
14     START
   1     1=Zero; 2=Define
35     COMMENT
   3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
   202.000     ID No.ó 99999
      .210     Area in hectares
     1.000     Length (PERV) metres
      .500     Gradient (%)
```

```
    99.000     Per cent Impervious
    40.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .024       .000       .012       .012 c.m/s
            .018       .214       .212     C perv/imperv/total
15     ADD RUNOFF
            .024       .024       .012       .012 c.m/s
35     COMMENT
   3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
   4 Depth - Discharge - Volume sets
        .000        .000          .0
        .080      .00200        42.0
        .120      .00300       126.0
        .160      .00400       210.0
       Peak Outflow    =      .002 c.m/s
       Maximum Depth   =      .083 metres
       Maximum Storage =       48. c.m
            .024       .024       .002       .012 c.m/s
35     COMMENT
   3     line(s) of comment
       *********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
  500     Junction Node No.
            .024       .024       .002       .012 c.m/s
14     START
   1     1=Zero; 2=Define
35     COMMENT
   3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
   203.000     ID No.ó 99999
      .230     Area in hectares
     1.000     Length (PERV) metres
      .500     Gradient (%)
```

```
    99.000     Per cent Impervious
    25.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .026       .000       .002       .012 c.m/s
            .018       .218       .216     C perv/imperv/total
15     ADD RUNOFF
            .026       .026       .002       .012 c.m/s
35     COMMENT
   3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
   4 Depth - Discharge - Volume sets
        .000        .000          .0
        .100      .00100        92.0
        .120      .00200       138.0
        .160      .00400       230.0
       Peak Outflow    =      .001 c.m/s
       Maximum Depth   =      .071 metres
       Maximum Storage =       65. c.m
            .026       .026       .001       .012 c.m/s
35     COMMENT
   3     line(s) of comment
       **********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       **********************************************
17     COMBINE
  500     Junction Node No.
            .026       .026       .001       .012 c.m/s
14     START
   1     1=Zero; 2=Define
35     COMMENT
   3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************
 4     CATCHMENT
   204.000     ID No.ó 99999
      .850     Area in hectares
     1.000     Length (PERV) metres
     1.500     Gradient (%)
```

```
    85.000     Per cent Impervious
    60.000     Length (IMPERV)
      .000     %Imp. with Zero Dpth
         1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
      .030     Manning "n"
    68.000     SCS Curve No or C
      .100     Ia/S Coefficient
     5.000     Initial Abstraction
         1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
            .084       .000       .001       .012 c.m/s
            .018       .215       .185     C perv/imperv/total
15     ADD RUNOFF
            .084       .084       .001       .012 c.m/s
35     COMMENT
   3     line(s) of comment
       *********************
       Parking Lot Ponding
       *********************
10     POND
   2 Depth - Discharge - Volume sets
      42.000        .000          .0
      42.300        .173       114.0
       Peak Outflow    =      .065 c.m/s
       Maximum Depth   =    42.113 metres
       Maximum Storage =       43. c.m
            .084       .084       .065       .012 c.m/s
17     COMBINE
  400     Junction Node No.
            .084       .084       .065       .065 c.m/s
18     CONFLUENCE
  400     Junction Node No.
            .084       .065       .065       .000 c.m/s
35     COMMENT
   3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
   4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        88.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .007 c.m/s
       Maximum Depth   =   339.486 metres
       Maximum Storage =      170. c.m
            .084       .065       .007       .000 c.m/s
35     COMMENT
```

```
      3     line(s) of comment
       *******************************
       Total Flow to Gordon St. Storm Sewer
       *************************************
17     COMBINE
    500     Junction Node No.
              .084       .065       .007       .013 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .084       .013       .007       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************************************
       Undeveloped Area - Flow to Torrance Watershed
       **********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .005       .000       .007       .000 c.m/s
              .018       .197       .022     C perv/imperv/total
15     ADD RUNOFF
              .005       .005       .007       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       10-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
```

```
    2221.000     Coefficient  a
      12.000     Constant  b    (min)
        .908     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
               56.266 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street
       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
        .120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .017       .000       .007       .000 c.m/s
              .025       .224       .164     C perv/imperv/total
15     ADD RUNOFF
              .017       .017       .007       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .017       .017       .017       .000 c.m/s
17     COMBINE
    500     Junction Node No.
              .017       .017       .017       .017 c.m/s
```

```
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
     202.000     ID No.ó 99999
        .210     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .031       .000       .017       .017 c.m/s
              .025       .230       .228     C perv/imperv/total
15     ADD RUNOFF
              .031       .031       .017       .017 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .080      .00200        42.0
          .120      .00300       126.0
          .160      .00400       210.0
       Peak Outflow    =      .002 c.m/s
       Maximum Depth   =      .090 metres
       Maximum Storage =       64. c.m
              .031       .031       .002       .017 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
    500     Junction Node No.
              .031       .031       .002       .018 c.m/s
```

```
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
     203.000     ID No.ó 99999
        .230     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .033       .000       .002       .018 c.m/s
              .025       .232       .230     C perv/imperv/total
15     ADD RUNOFF
              .033       .033       .002       .018 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .100      .00100        92.0
          .120      .00200       138.0
          .160      .00400       230.0
       Peak Outflow    =      .001 c.m/s
       Maximum Depth   =      .090 metres
       Maximum Storage =       83. c.m
              .033       .033       .001       .018 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
    500     Junction Node No.
              .033       .033       .001       .018 c.m/s
```

```
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************
 4     CATCHMENT
    204.000     ID No.ó 99999
       .850     Area in hectares
      1.000     Length (PERV) metres
      1.500     Gradient (%)
     85.000     Per cent Impervious
     60.000     Length (IMPERV)
       .000     %Imp. with Zero Dpth
          1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .030     Manning "n"
     68.000     SCS Curve No or C
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
          1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
             .110       .000       .001       .018 c.m/s
             .025       .231       .200     C perv/imperv/total
15     ADD RUNOFF
             .110       .110       .001       .018 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Lot Ponding
       **********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000        .000          .0
        42.300        .173       114.0
       Peak Outflow    =      .090 c.m/s
       Maximum Depth   =    42.157 metres
       Maximum Storage =       60. c.m
             .110       .110       .090       .018 c.m/s
17     COMBINE
   400     Junction Node No.
             .110       .110       .090       .090 c.m/s
18     CONFLUENCE
   400     Junction Node No.
             .110       .090       .090       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
```

```
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        88.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .009 c.m/s
       Maximum Depth   =   339.642 metres
       Maximum Storage =      225. c.m
              .110       .090       .009       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ******************************
       Total Flow to Gordon St. Storm Sewer
       ***********************************
17     COMBINE
    500     Junction Node No.
              .110       .090       .009       .019 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .110       .019       .009       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************************************
       Undeveloped Area - Flow to Torrance Watershed
       **********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .009       .000       .009       .000 c.m/s
              .024       .207       .028     C perv/imperv/total
15     ADD RUNOFF
              .009       .009       .009       .000 c.m/s
14     START
```

```
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       25-yr STORM


       **********************
 2     STORM
          1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
   3158.000     Coefficient  a
     15.000     Constant  b    (min)
       .935     Exponent  c
       .400     Fraction to peak  r
    180.000     Duration ó 4500 min
             68.416 mm     Total depth
 3     IMPERVIOUS
          1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .010     Manning "n"
     98.000     SCS Curve No or C
       .100     Ia/S Coefficient
      1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street
       ***********************************
 4     CATCHMENT
    201.000     ID No.ó 99999
       .120     Area in hectares
      1.000     Length (PERV) metres
      2.000     Gradient (%)
     70.000     Per cent Impervious
     10.000     Length (IMPERV)
       .000     %Imp. with Zero Dpth
          1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
       .030     Manning "n"
     68.000     SCS Curve No or C
       .100     Ia/S Coefficient
      5.000     Initial Abstraction
          1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
             .022       .000       .009       .000 c.m/s
             .033       .236       .175     C perv/imperv/total
15     ADD RUNOFF
```

```
              .022       .022       .009       .000 c.m/s
 9     ROUTE
         .000     Conduit Length
         .000     No Conduit defined
         .000     Zero lag
         .000     Beta weighting factor
         .000     Routing timestep
            0     No. of sub-reaches
              .022       .022       .022       .000 c.m/s
17     COMBINE
    500     Junction Node No.
              .022       .022       .022       .022 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
     202.000     ID No.ó 99999
        .210     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .040       .000       .022       .022 c.m/s
              .033       .245       .243     C perv/imperv/total
15     ADD RUNOFF
              .040       .040       .022       .022 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .080      .00200        42.0
          .120      .00300       126.0
          .160      .00400       210.0
```

```
       Peak Outflow    =      .003 c.m/s
       Maximum Depth   =      .101 metres
       Maximum Storage =       86. c.m
              .040       .040       .003       .022 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       **********************************************
17     COMBINE
    500     Junction Node No.
              .040       .040       .003       .023 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
     203.000     ID No.ó 99999
        .230     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .045       .000       .003       .023 c.m/s
              .033       .247       .245     C perv/imperv/total
15     ADD RUNOFF
              .045       .045       .003       .023 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
           .000        .000          .0
           .100      .00100        92.0
           .120      .00200       138.0
           .160      .00400       230.0
```

```
       Peak Outflow    =      .001 c.m/s
       Maximum Depth   =      .106 metres
       Maximum Storage =      106. c.m
              .045       .045       .001       .023 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       **********************************************
17     COMBINE
    500     Junction Node No.
              .045       .045       .001       .023 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************
 4     CATCHMENT
     204.000     ID No.ó 99999
        .850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .140       .000       .001       .023 c.m/s
              .033       .247       .215     C perv/imperv/total
15     ADD RUNOFF
              .140       .140       .001       .023 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************
       Parking Lot Ponding
       *********************
10     POND
      2 Depth - Discharge - Volume sets
         42.000        .000          .0
         42.300        .173       114.0
       Peak Outflow    =      .120 c.m/s
       Maximum Depth   =    42.209 metres
```

```
       Maximum Storage =       79. c.m
              .140       .140       .120       .023 c.m/s
17     COMBINE
    400     Junction Node No.
              .140       .140       .120       .120 c.m/s
18     CONFLUENCE
    400     Junction Node No.
              .140       .120       .120       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        88.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .011 c.m/s
       Maximum Depth   =   339.856 metres
       Maximum Storage =      300. c.m
              .140       .120       .011       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *******************************
       Total Flow to Gordon St. Storm Sewer
       ************************************
17     COMBINE
    500     Junction Node No.
              .140       .120       .011       .024 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .140       .024       .011       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************************************
       Undeveloped Area - Flow to Torrance Watershed
       **********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .018       .000       .011       .000 c.m/s
              .032       .219       .036     C perv/imperv/total
15     ADD RUNOFF
              .018       .018       .011       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       50-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    3886.000     Coefficient  a
      16.000     Constant  b    (min)
        .949     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
               77.819 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street
       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
        .120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
```

```
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .026       .000       .011       .000 c.m/s
              .038       .242       .181     C perv/imperv/total
15     ADD RUNOFF
              .026       .026       .011       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .026       .026       .026       .000 c.m/s
17     COMBINE
    500     Junction Node No.
              .026       .026       .026       .026 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
     202.000     ID No.ó 99999
        .210     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .047       .000       .026       .026 c.m/s
              .039       .255       .253     C perv/imperv/total
15     ADD RUNOFF
```

```
              .047       .047       .026       .026 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .080      .00200        42.0
          .120      .00300       126.0
          .160      .00400       210.0
       Peak Outflow    =      .003 c.m/s
       Maximum Depth   =      .109 metres
       Maximum Storage =      103. c.m
              .047       .047       .003       .026 c.m/s
35     COMMENT
      3     line(s) of comment
       ***********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       ***********************************************
17     COMBINE
    500     Junction Node No.
              .047       .047       .003       .027 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
     203.000     ID No.ó 99999
        .230     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .055       .000       .003       .027 c.m/s
              .039       .257       .254     C perv/imperv/total
15     ADD RUNOFF
```

```
              .055       .055       .003       .027 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
          .000        .000          .0
          .100      .00100        92.0
          .120      .00200       138.0
          .160      .00400       230.0
       Peak Outflow    =      .002 c.m/s
       Maximum Depth   =      .114 metres
       Maximum Storage =      125. c.m
              .055       .055       .002       .027 c.m/s
35     COMMENT
      3     line(s) of comment
       ***********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       ***********************************************
17     COMBINE
    500     Junction Node No.
              .055       .055       .002       .027 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Area Catchment
       **********************
 4     CATCHMENT
     204.000     ID No.ó 99999
        .850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .163       .000       .002       .027 c.m/s
              .039       .256       .223     C perv/imperv/total
15     ADD RUNOFF
```

```
              .163       .163       .002       .027 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Lot Ponding
       **********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000        .000          .0
        42.300        .173       114.0
       Peak Outflow    =      .145 c.m/s
       Maximum Depth   =    42.252 metres
       Maximum Storage =       96. c.m
              .163       .163       .145       .027 c.m/s
17     COMBINE
    400     Junction Node No.
              .163       .163       .145       .145 c.m/s
18     CONFLUENCE
    400     Junction Node No.
              .163       .145       .145       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        88.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .012 c.m/s
       Maximum Depth   =   340.021 metres
       Maximum Storage =      357. c.m
              .163       .145       .012       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *******************************
       Total Flow to Gordon St. Storm Sewer
       ************************************
17     COMBINE
    500     Junction Node No.
              .163       .145       .012       .029 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .163       .029       .012       .000 c.m/s
14     START
      1     1=Zero; 2=Define
```

```
35     COMMENT
      3     line(s) of comment
       **********************************************
       Undeveloped Area - Flow to Torrance Watershed
       **********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .026       .000       .012       .000 c.m/s
              .038       .226       .042     C perv/imperv/total
15     ADD RUNOFF
              .026       .026       .012       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      7     line(s) of comment
       **********************


       100-yr STORM


       **********************
 2     STORM
           1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
    4688.000     Coefficient  a
      17.000     Constant  b    (min)
        .962     Exponent  c
        .400     Fraction to peak  r
     180.000     Duration ó 4500 min
                87.226 mm     Total depth
 3     IMPERVIOUS
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .010     Manning "n"
      98.000     SCS Curve No or C
        .100     Ia/S Coefficient
       1.500     Initial Abstraction
```

```
35     COMMENT
      3     line(s) of comment
       ***********************************
       Uncontrolled Flow to Gordon Street
       ***********************************
 4     CATCHMENT
     201.000     ID No.ó 99999
        .120     Area in hectares
       1.000     Length (PERV) metres
       2.000     Gradient (%)
      70.000     Per cent Impervious
      10.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .030       .000       .012       .000 c.m/s
              .043       .247       .186     C perv/imperv/total
15     ADD RUNOFF
              .030       .030       .012       .000 c.m/s
 9     ROUTE
        .000     Conduit Length
        .000     No Conduit defined
        .000     Zero lag
        .000     Beta weighting factor
        .000     Routing timestep
           0     No. of sub-reaches
              .030       .030       .030       .000 c.m/s
17     COMBINE
    500     Junction Node No.
              .030       .030       .030       .030 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       West Building - Roof Area
       ****************************
 4     CATCHMENT
     202.000     ID No.ó 99999
        .210     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      40.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .053       .000       .030       .030 c.m/s
              .045       .263       .260     C perv/imperv/total
15     ADD RUNOFF
              .053       .053       .030       .030 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       West Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
         .000        .000          .0
         .080      .00200        42.0
         .120      .00300       126.0
         .160      .00400       210.0
       Peak Outflow    =      .003 c.m/s
       Maximum Depth   =      .118 metres
       Maximum Storage =      121. c.m
              .053       .053       .003       .030 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************************
       West Roof-top Flow to Gordon St. Storm Sewer
       *********************************************
17     COMBINE
    500     Junction Node No.
              .053       .053       .003       .031 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       ****************************
       East Building - Roof Area
       ****************************
 4     CATCHMENT
     203.000     ID No.ó 99999
        .230     Area in hectares
       1.000     Length (PERV) metres
        .500     Gradient (%)
      99.000     Per cent Impervious
      25.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .065       .000       .003       .031 c.m/s
              .045       .264       .261     C perv/imperv/total
15     ADD RUNOFF
              .065       .065       .003       .031 c.m/s
35     COMMENT
      3     line(s) of comment
       *********************************
       East Building - Rooftop Control
       *********************************
10     POND
      4 Depth - Discharge - Volume sets
         .000        .000          .0
         .100      .00100        92.0
         .120      .00200       138.0
         .160      .00400       230.0
       Peak Outflow    =      .002 c.m/s
       Maximum Depth   =      .122 metres
       Maximum Storage =      143. c.m
              .065       .065       .002       .031 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************************************
       East Roof-top Flow to Gordon St. Storm Sewer
       **********************************************
17     COMBINE
    500     Junction Node No.
              .065       .065       .002       .031 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************
       Parking area Catchment
       **********************
 4     CATCHMENT
     204.000     ID No.ó 99999
        .850     Area in hectares
       1.000     Length (PERV) metres
       1.500     Gradient (%)
      85.000     Per cent Impervious
      60.000     Length (IMPERV)
```

```
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      68.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .195       .000       .002       .031 c.m/s
              .044       .262       .230     C perv/imperv/total
15     ADD RUNOFF
              .195       .195       .002       .031 c.m/s
35     COMMENT
      3     line(s) of comment
       **********************
       Parking Lot Ponding
       **********************
10     POND
      2 Depth - Discharge - Volume sets
        42.000        .000          .0
        42.300        .173       114.0
       Peak Outflow    =      .170 c.m/s
       Maximum Depth   =    42.296 metres
       Maximum Storage =      112. c.m
              .195       .195       .170       .031 c.m/s
17     COMBINE
    400     Junction Node No.
              .195       .195       .170       .170 c.m/s
18     CONFLUENCE
    400     Junction Node No.
              .195       .170       .170       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       ***************************
       Underground Storage Tank
       ***************************
10     POND
      4 Depth - Discharge - Volume sets
       339.000        .000          .0
       339.250      .00500        94.0
       340.000       .0120       350.0
       340.250       .0130       438.0
       Peak Outflow    =      .013 c.m/s
       Maximum Depth   =   340.199 metres
       Maximum Storage =      420. c.m
              .195       .170       .013       .000 c.m/s
35     COMMENT
      3     line(s) of comment
       *******************************
```

```
       Total Flow to Gordon St. Storm Sewer
       ************************************
17     COMBINE
    500     Junction Node No.
              .195       .170       .013       .033 c.m/s
18     CONFLUENCE
    500     Junction Node No.
              .195       .033       .013       .000 c.m/s
14     START
      1     1=Zero; 2=Define
35     COMMENT
      3     line(s) of comment
       **********************************************
       Undeveloped Area - Flow to Torrance Watershed
       **********************************************
 4     CATCHMENT
     205.000     ID No.ó 99999
       1.440     Area in hectares
     120.000     Length (PERV) metres
       4.000     Gradient (%)
       2.000     Per cent Impervious
       5.000     Length (IMPERV)
        .000     %Imp. with Zero Dpth
           1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
        .030     Manning "n"
      67.000     SCS Curve No or C
        .100     Ia/S Coefficient
       5.000     Initial Abstraction
           1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
              .036       .000       .013       .000 c.m/s
              .044       .231       .048     C perv/imperv/total
15     ADD RUNOFF
              .036       .036       .013       .000 c.m/s
14     START
      1     1=Zero; 2=Define
20     MANUAL
```

ROCK TRENCH SIZING CALCULATIONS

Roof Ponding (buildings 1+2)			Infiltration Gallery 2		
Impervious area	4400	sq.m	Roof area	4400	sq.m
			RG Area		sq.m
			Directly to Tench	8500	sq.m
Total area:	4400	sq.m	Total area:	12900	sq.m
			Trench surf. area:	670	sq.m
			Trench depth:	0.96	m
			Trench porosity:	0.35	
			Trench full:	225.12	cu.m
			Trench initial vol:	0	cu.m
			Subsoil exfil. rate:	7	mm/hr
			Soil depth:		mm
			Soil porosity:		
			Soil field cap:		
			Soil wilt point:		
			Soil infil. rate		mm/hr
			Soil wilt point vol:		cu.m
depth of rain	0.023		Soil porosity vol:		cu.m
Rain Volume	102.8		Soil field cap vol:		cu.m
P volume	717.2		Soil initial vol:		cu.m
Ponding	0.163	m	Ponding		m
Orifice	75.00	mm	I/P	12.7	
max ponding	0.021	m	Safety Factor		
P volume	92.73	sq.m	Area with SF		

Summary	**Roof (1+5)**	**IG 2**
Total evaporation		0.0
Total exfiltration		322.8
Total drainflow	110.1	0.0
Total runoff	0.0	0.0
Total Reused		
Sum	110.1	322.8
Total rainfall	110.1	432.9
% Treated	100%	100%
% untreated	0%	0%
% Captured	0%	100%
EIA	100%	0%

STORMCEPTOR SIZING REPORT

Stormceptor® EF Sizing Report

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION STORMCEPTOR®

03/24/2020

Province:	Ontario
City:	Guelph
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
NCDC Rainfall Station Id:	9387
Years of Rainfall Data:	34

Project Name:	1250 Gordon Street
Project Number:	161413684
Designer Name:	Claire Phelps
Designer Company:	Stantec
Designer Email/Phone:	Claire.Phelps@stantec.com
EOR Name:	
EOR Company:	
EOR Email/Phone:	

Site Name:	1250 Gordon Street

Drainage Area (ha):	0.85
% Imperviousness:	85.00

Runoff Coefficient 'c': 0.81

Particle Size Distribution:	>75 micron
Target TSS Removal (%):	80.0

Require Hydrocarbon Spill Capture?	No
Upstream Flow Control?	No
Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	95
EF6	98
EF8	99
EF10	99
EF12	99

Recommended Stormceptor EF Model: **EF4**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **95**

THIRD-PARTY TESTING AND VERIFICATION

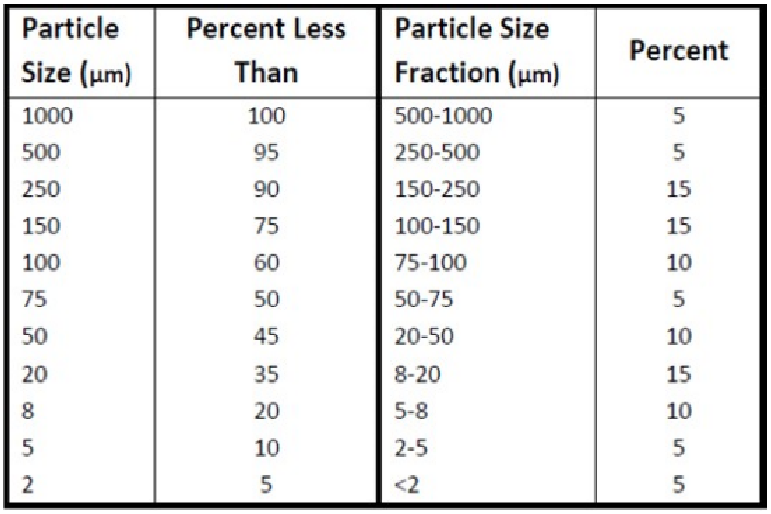
►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.



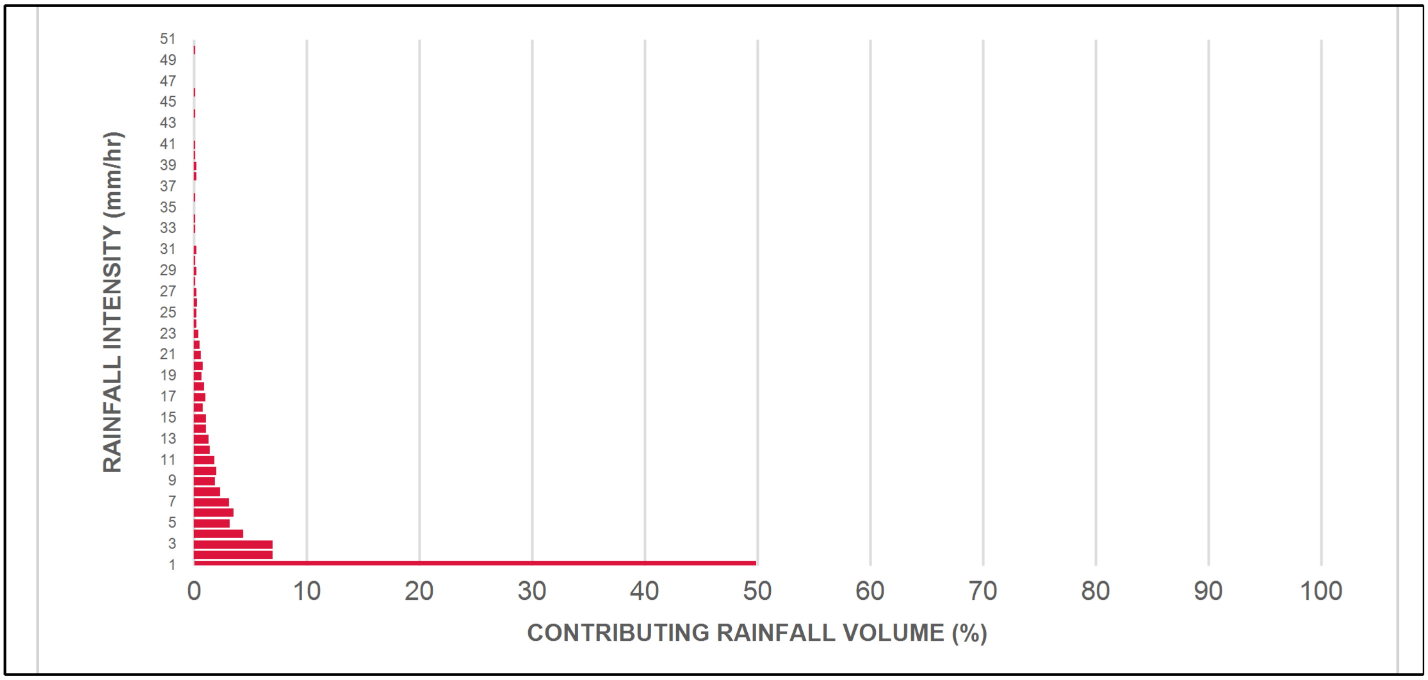
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	49.9	49.9	1.91	115.0	96.0	100	49.9	49.9
2	7.0	56.9	3.83	230.0	191.0	100	7.0	56.9
3	7.0	63.9	5.74	345.0	287.0	99	6.9	63.8
4	4.4	68.3	7.66	459.0	383.0	97	4.3	68.1
5	3.2	71.5	9.57	574.0	479.0	96	3.1	71.2
6	3.5	75.0	11.48	689.0	574.0	94	3.3	74.5
7	3.1	78.1	13.40	804.0	670.0	93	2.9	77.4
8	2.3	80.4	15.31	919.0	766.0	93	2.1	79.5
9	1.9	82.3	17.23	1034.0	861.0	92	1.7	81.3
10	2.0	84.3	19.14	1148.0	957.0	91	1.8	83.1
11	1.8	86.1	21.05	1263.0	1053.0	92	1.7	84.7
12	1.4	87.5	22.97	1378.0	1148.0	94	1.3	86.1
13	1.3	88.8	24.88	1493.0	1244.0	96	1.2	87.3
14	1.1	89.9	26.80	1608.0	1340.0	98	1.1	88.4
15	1.1	91.0	28.71	1723.0	1436.0	97	1.1	89.4
16	0.8	91.8	30.62	1837.0	1531.0	91	0.7	90.2
17	1.0	92.8	32.54	1952.0	1627.0	86	0.9	91.0
18	0.9	93.7	34.45	2067.0	1723.0	81	0.7	91.7
19	0.7	94.4	36.37	2182.0	1818.0	77	0.5	92.3
20	0.8	95.2	38.28	2297.0	1914.0	73	0.6	92.9
21	0.6	95.8	40.19	2412.0	2010.0	69	0.4	93.3
22	0.5	96.3	42.11	2527.0	2105.0	66	0.3	93.6
23	0.4	96.7	44.02	2641.0	2201.0	63	0.3	93.9
24	0.2	96.9	45.94	2756.0	2297.0	61	0.1	94.0
25	0.2	97.1	47.85	2871.0	2393.0	58	0.1	94.1

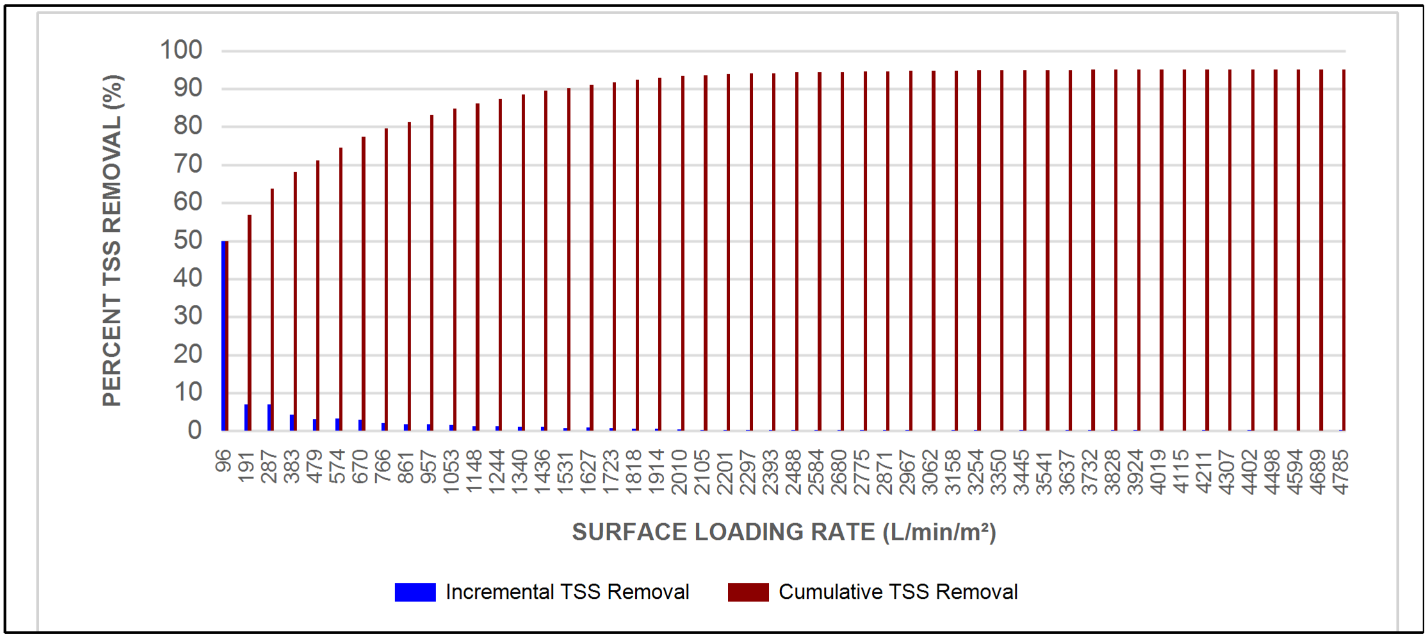
Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.3	97.4	49.76	2986.0	2488.0	56	0.2	94.3
27	0.2	97.6	51.68	3101.0	2584.0	54	0.1	94.4
28	0.1	97.7	53.59	3216.0	2680.0	53	0.1	94.4
29	0.2	97.9	55.51	3330.0	2775.0	51	0.1	94.5
30	0.1	98.0	57.42	3445.0	2871.0	50	0.1	94.6
31	0.2	98.2	59.33	3560.0	2967.0	48	0.1	94.7
32	0.0	98.2	61.25	3675.0	3062.0	46	0.0	94.7
33	0.1	98.3	63.16	3790.0	3158.0	45	0.0	94.7
34	0.1	98.4	65.08	3905.0	3254.0	43	0.0	94.8
35	0.0	98.4	66.99	4019.0	3350.0	42	0.0	94.8
36	0.1	98.5	68.91	4134.0	3445.0	41	0.0	94.8
37	0.0	98.5	70.82	4249.0	3541.0	40	0.0	94.8
38	0.2	98.7	72.73	4364.0	3637.0	39	0.1	94.9
39	0.2	98.9	74.65	4479.0	3732.0	37	0.1	95.0
40	0.1	99.0	76.56	4594.0	3828.0	36	0.0	95.0
41	0.1	99.1	78.48	4709.0	3924.0	36	0.0	95.0
42	0.0	99.1	80.39	4823.0	4019.0	35	0.0	95.0
43	0.0	99.1	82.30	4938.0	4115.0	34	0.0	95.0
44	0.1	99.2	84.22	5053.0	4211.0	33	0.0	95.1
45	0.0	99.2	86.13	5168.0	4307.0	32	0.0	95.1
46	0.1	99.3	88.05	5283.0	4402.0	32	0.0	95.1
47	0.0	99.3	89.96	5398.0	4498.0	32	0.0	95.1
48	0.0	99.3	91.87	5512.0	4594.0	31	0.0	95.1
49	0.0	99.3	93.79	5627.0	4689.0	30	0.0	95.1
50	0.1	99.4	95.70	5742.0	4785.0	29	0.0	95.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**95 %**

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter (m)	(ft)	Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter (mm)	(in)	Max Outlet Pipe Diameter (mm)	(in)	Peak Conveyance Flow Rate (L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

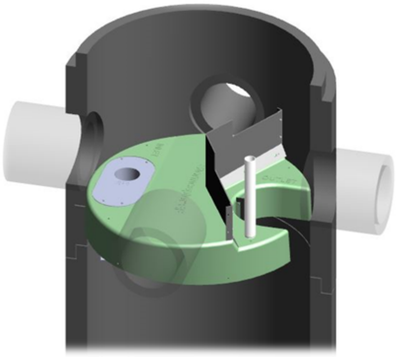
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

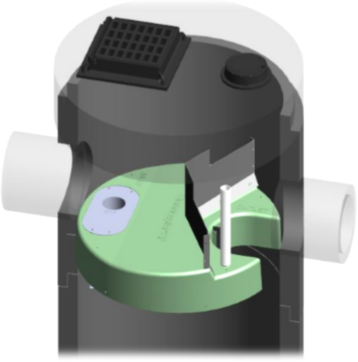
DESIGN FLEXIBILITY

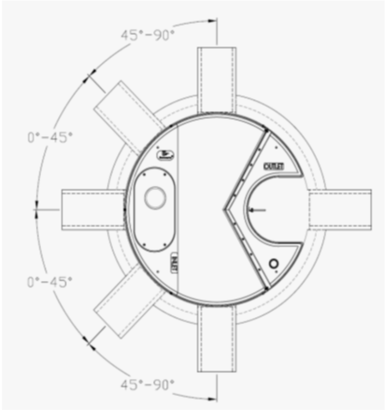
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	197	52	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	348	92	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	545	144	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	874	231	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	1219	322	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The **minimum** sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program’s **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

APPENDIX H
FIELD NOTES

APPENDIX H.1
ELC

Plant list

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	**SITE (project no./name):** 1250 Gordon	**POLYGON:** Res. Plantlist	
	SURVEYOR(S): M Straus.	**DATE:** June 6/18	**PHOTO No.:**
	START: — **END:**	**ZONE & UTM:**	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
		☐ RIVERINE		☐ SUBMERGED	☐ POND
☐ WETLAND	☐ MINERAL SOIL	☐ BOTTOMLAND	☐ CULTURAL	☐ FLOATING-LVD.	☐ RIVER
		☐ TERRACE		☐ GRAMINOID	☐ STREAM
☐ AQUATIC	☐ PARENT MIN.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
		☐ TABLELAND		☐ LICHEN	☐ SWAMP
	☐ ACIDIC BEDRK.	☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
		☐ CLIFF		☐ DECIDUOUS	☐ BOG
	☐ BASIC BEDRK.	☐ TALUS		☐ CONIFEROUS	☐ BARREN
SITE		☐ CREVICE / CAVE	**COVER**	☐ MIXED	☐ MEADOW
☐ OPEN WATER	☐ CARB. BEDRK.	☐ ALVAR	☐ OPEN		☐ PRAIRIE
☐ SHALLOW WATER		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
☐ SURFICIAL DEP.		☐ SAND DUNE			☐ WOODLAND
☐ BEDROCK		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2		
2	SUB-CANOPY	3		
3	UNDERSTOREY	4.		
4	GRD. LAYER	5-7	4	goldenrod, orchard grass.

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:							**BA:**	
SIZE CLASS ANALYSIS:	O	<10	R	10 – 24	O	25 – 50	R-O	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	N	<10	N	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	**DEPTH TO MOTTLES/GLEY**	g=	G=
MOISTURE:	**DEPTH OF ORGANICS:**	(cm)	
HOMOGENEOUS / VARIABLE	**DEPTH TO BEDROCK:**	(cm)	

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:		**CODE:**
COMMUNITY SERIES:		**CODE:**
ECOSITE:		**CODE:**
VEGETATION TYPE:		**CODE:**
INCLUSION		**CODE:**
COMPLEX		**CODE:**

Notes: (e.g. disturbance, surface water depths, etc.)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
N. Spruce	RO				
Silver Maple.	R				
THUOCC.					
JUGNIGR.		R			
Apple tre.			R		
Norway Maple	R				
Betula sp.	R				
POPTREM	R				
Bamboo?					
Mountain Ash			R		

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Canada Thistle				R-O	
Poison Ivy.				R	
Orchard Grass				O	
Goldenrod.				D	
Creeping Charlie				R-O	
VICCRA				R	
Kentucky Bluegrass				O	
Forget me nots.				R-O	
Goutweed.				R	
Celandine				R	
Dandelion				O	
Lily of the valley (poss. one).				R-O	
Ostrich fern. O				R	
burdock					
Columbine (orn.)					
Virg creeper					
Tansy					
~~Gar~~ dame's rocket					

Page 1 of 2

Print Name: M STRAUS

(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:

(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413684. Polygon No.:

Assessment Type: ☐-Visual; no access/☐-Entire; walk through feature/☒-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
	12	7km/hr	100	0	0

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

Some residences are occupied. Didn't inspect fully (dogs barking etc.)

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible) none observed.					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency					
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 2 of 2

Print Name: MStraus.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	**SITE** (project no./name): 1250 Gordon		**POLYGON:** A.	
	SURVEYOR(S): MStraus		**DATE:** June 6/18.	**PHOTO No.:**
	START: 1300	**END:** 1400	**ZONE & UTM:**	

POLYGON DESCRIPTION

SYSTEM
- ☒ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SUBSTRATE
- ☐ ORGANIC
- ☒ MINERAL SOIL
- ☐ PARENT MIN.
- ☐ ACIDIC BEDRK.
- ☐ BASIC BEDRK.
- ☐ CARB. BEDRK.

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☒ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☒ NATURAL
- ☒ CULTURAL

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD.
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☒ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

Patchy so woodland but cover high in some spots

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☒ WOODLAND
- ☒ FOREST
- ☐ PLANTATION

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☒ SURFICIAL DEP.
- ☐ BEDROCK

COVER
- ☐ OPEN
- ☐ SHRUB
- ☒ TREED

STAND DESCRIPTION:

2 = 1.

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Sugar Maple < JUGNIGR
2	SUB-CANOPY	3	4	JUGNIGR
3	UNDERSTOREY	4	4	Lontart < RHACATH
4	GRD. LAYER	5-7	4	goldenrod, Vines,

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION: **BA:** ✓ (HR surv. only

SIZE CLASS ANALYSIS:	A	<10	O	10 – 24	R	25 – 50	R	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O-A	<10	O	10 – 24	R	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:		PIONEER	X	YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	**DEPTH TO MOTTLES/GLEY**	g=	G=
MOISTURE:	**DEPTH OF ORGANICS:**		(cm)
HOMOGENEOUS / VARIABLE	**DEPTH TO BEDROCK:**		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:		**CODE:**	
COMMUNITY SERIES:		**CODE:**	
ECOSITE:		**CODE:**	
VEGETATION TYPE:	D-F Black Walnut Dec. Woodland.	**CODE:**	WODM4-4
INCLUSION		**CODE:**	
COMPLEX		**CODE:**	

Notes: (e.g. disturbance, surface water depths, etc.)

Row of planted N. Spruce ?. - Norway Spruce regen. Plantation

- Poss Bn @ 501916. 4836429

Tree 372 = Bn: 564538 · 4818553

Unknown elm? 10m towards house

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Sugar Maple.	R-O				
~~HAUOCCI~~	R	R			
JUGNIGR	O	O	O		
ACENEG.	R				
TILAMER.		R			
Norway Spruce	O	← HR			
Juniper (tag 336)		R			
ULMAMER.		R			
PRUSERO	R				
PINSYLV		O			
Willow	R.				
Little leaf Linden			R		
AL Dogwood			R		
FRAAMER.		R	R		
LONTAR.			O		
PRUVIVI					
Red Osier Dogwood			R		
RHACATH			O		
Amelanchier Sp.			R		

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Virg. Creeper				O-A	
Enchanter's nightshade				O	
goldenrod sp.				O	
Kentucky Blue grass	O			R	
Dandelion				R	
VITRIPA.				O	
unkn. planted but Heuchera (leaves w water marks)				R-O	
Avens white				R	
periwinkle.				R	
Lilac			R		
Lactuca sp.				R	
White avens.				R	
HERAUKS				R	
garlic mustard				R	
lily of the valley				R - patch	

Page 1 of 16 * no Sugar Maple/Walnut forest - n/a This is complete ☐ & legible ☐

Print Name: MSTRAUS (Field Notes Author) Signature: (Field Notes QA/QC personnel)

young forest

V:\01609\resource\Internal Info and Teams\FIELD FORMS\Vegetation\ELC\elc-wildlife-habitat-form-update_rev-02.docx / (DERIVED FROM LEE ET AL., 1998)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413684. Polygon No.: A.

Assessment Type: ☐-Visual; no access/☒-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
	12°C	7Km/h	100	0	0

NOTES & SPECIES OBSERVATIONS (list species and type of ation, indicate on map):

BCCH - OB - P
YB Cuckoo - VO
NOCA
red squirrel obs. in nest in planted conif. tre.
CHSP-VO
WBNU.
BLJA - obs. carrying food
COGR

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	**Site Assessment**	**Photo ID**	**Map ID**	**UTM Coordinates**		
				Zone	**Easting**	**Northing**
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows none observed					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency					
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 2 of 16

Print Name: WSTRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	SITE (project no./name): 1258 Gordon.		POLYGON: B
	SURVEYOR(S): M STRAUS.	DATE: June 6/18	PHOTO No.:
	START: 1330 END: 1430	ZONE & UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☒ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☒ MINERAL SOIL	☐ RIVERINE	☒ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☒ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☒ FORB	☐ MARSH
	☐ CARB. BEDRK.	☒ TABLELAND		☐ LICHEN	☐ SWAMP
		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
		☐ CLIFF		☐ DECIDUOUS	☐ BOG
		☐ TALUS		☐ CONIFEROUS	☐ BARREN
SITE		☐ CREVICE / CAVE	**COVER**	☐ MIXED	☒ MEADOW
☐ OPEN WATER		☐ ALVAR	☒ OPEN		☐ PRAIRIE
☐ SHALLOW WATER		☐ ROCKLAND	☐ SHRUB		☐ THICKET
☒ SURFICIAL DEP.		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
☐ BEDROCK		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)	B₂
1	CANOPY	1-2	1	ULMAMER	
2	SUB-CANOPY	3	1	ULMAMER > 1 PINSYLV	
3	UNDERSTOREY	4.5	2	LONTART < RHACATH	RHACATH
4	GRD. LAYER	6-7	4	DACTGLAU/> fleabane	goldenrod > VITRIPA

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:	✓shrubs only not trees Ocassional						BA:	
SIZE CLASS ANALYSIS:	A ✓	<10	R	10 – 24	R	25 – 50	R	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	N	<10	R	10 – 24	R	25 – 50	R	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:	☒	PIONEER	☐	YOUNG	☐	MID-AGE	☐	MATURE	☐	OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES/GLEY	g=	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:		CODE:
COMMUNITY SERIES:		CODE:
ECOSITE:		CODE:
VEGETATION TYPE:	Mineral cultural meadow	CODE: CUM1
INCLUSION		CODE:
COMPLEX		CODE:

Notes: (e.g. disturbance, surface water depths, etc.)

- Disturbed meadow.
- B₂ Sp. comp. region from frost.
- chipping / evidence of tree removal.

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
PINSYLV	-	R			
ULMAMER.	R	O			
Sugar Maple.					
FRAAMER.			·	R	(B₂)
JUGNIGR.			R	R	
RHACATH			R		
LONTART			O		
Rus. Olive			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
fleabane sp.				O-A	✓ photo
DACGLAU				A	
DAUCARO				R-O	
black medic				R	
goldenrod sp.				O-A	
mentha sp.				R	
Bladder campion.				R	
ox eye daisy				R	
yellow hawkweed				R	
B₂ Com. Thistle				R	
burdock.				R	
mullein.				R	
VIT RIPA.				O	
Rubus (stri)				R	
yellow Buttercup tail				R	
FRAVIRG					
Timothy				O-A	
RUDHIRT				O	
asparagus.				R	
Heal all				R	
Bf trefoil				O	
spotted knapweed.				R	
Agrostis				O-A.	
Bindweed (white)				R	
arrow				R	
~~Y[illegible]~~ primrose?				R	✓ photo
red clover				R	

Page 3 of 16

Print Name: M STRAUS.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413684 Polygon No.: B

Assessment Type: ☐-Visual; no access/☒-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
	See p 2				

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

photographs & butterflies.

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates Zone	UTM Coordinates Easting	UTM Coordinates Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows none obs.					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency					
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 4 of 16

Print Name NStraus
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	**SITE** (project no.(name)): 61413684.		**POLYGON:** C	
	SURVEYOR(S): MSTRAUS	**DATE:** June 6 / 18		**PHOTO No.:**
	START: 1410	**END:** 1430	**ZONE & UTM:**	

POLYGON DESCRIPTION

SYSTEM
- ☒ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☒ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☒ MINERAL SOIL
- ☐ PARENT MIN.
- ☐ ACIDIC BEDRK.
- ☐ BASIC BEDRK.
- ☐ CARB. BEDRK.

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☒ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☒ NATURAL
- ☐ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☒ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD.
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☑ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☒ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	THUOCCI >> PRUSER
2	SUB-CANOPY	3	4	" >> "
3	UNDERSTOREY	4	0	all tall
4	GRD. LAYER	5-7	1	1 patch of MAICANA, 1 patch sensitive fern

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:		**BA:**

SIZE CLASS ANALYSIS:	R	<10	O-A	10 – 24	A	25 – 50	N	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:		PIONEER		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	**DEPTH TO MOTTLES/GLEY**	g=	G=
MOISTURE:	**DEPTH OF ORGANICS:**		(cm)
HOMOGENEOUS / VARIABLE	**DEPTH TO BEDROCK:**		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:	**CODE:**
COMMUNITY SERIES:	**CODE:**
ECOSITE:	**CODE:**
VEGETATION TYPE: D-F White Cedar Conif. Forest	**CODE:** FOC 2-2
INCLUSION	**CODE:**
COMPLEX	**CODE:**

Notes: (e.g. disturbance, surface water depths, etc.)

confirm soils - upper slope + gradually lowers until BW

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
THUOCCI	D				
FRAAMER	R				
PRUSERO	O				
JUGNIGR	R				
RHACATH		R			
Glossy buckthorn			R (edge)		
POPBALS			R (edge?)		

SPECIES CODE	LAYER 1	2	3	4	COLL.
MAICANA				R	
POPLAR				R	
Sensitive fern				R	

Page 5 of 16

Print Name: MSTRAUS.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413684. Polygon No.: C

Assessment Type: ☐-Visual; no access/☒-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
	See	Page 2			

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

- jawbone. (fox?).
- see BB.

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	**Site Assessment**		**Photo ID**	**Map ID**	**UTM Coordinates**		
					Zone	**Easting**	**Northing**
ALL SITES							
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)						
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate						
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows						
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size	none obs					
WOODLANDS							
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency						
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)							
WETLANDS							
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency						
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature						
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys						

Page 6 of 16

Print Name: M STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	SITE (project no./name): 1250 Bordon		POLYGON: D
	SURVEYOR(S): M STRAUS.	DATE: June 6 / 2018.	PHOTO No.:
	START: 1420	END: 1450	ZONE & UTM:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☒ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☒ MINERAL SOIL	☐ RIVERINE	☒ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☒ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF		☐ DECIDUOUS	☐ BOG
☒ SURFICIAL DEP.		☐ TALUS		☒ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE	**COVER**	☐ MIXED	☐ MEADOW
		☐ ALVAR	☐ OPEN		☐ PRAIRIE
		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☒ TREED		☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☒ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	4	N. Spruce >> JUGNIGR
2	SUB-CANOPY	3	4	" > "
3	UNDERSTOREY	4	2	N. Spruce.
4	GRD. LAYER	5-7	3	goldenrod.

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:	BA:

SIZE CLASS ANALYSIS:	R	<10	A	10 – 24	O-A	25 – 50	N	>50
STANDING SNAGS:	-	<10	-	10 – 24	-	25 – 50	-	>50
DEADFALL/LOGS:	R	<10	R	10 – 24	N	25 – 50	✓	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:		PIONEER		YOUNG	✓	MID-AGE		MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES/GLEY	g=	G=
MOISTURE:	DEPTH OF ORGANICS:		(cm)
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE: Coniferous Plantation.	CODE: CUP3
INCLUSION	CODE:
COMPLEX	CODE:

Notes: (e.g. disturbance, surface water depths, etc.)

- CUP - N. Spruce - ⊃ edges Regen. no ground layer/ in centre
limited

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
N. Spruce.	D				
JUGNIGR	R	R-O			
Thuocc					
glossy buckthorn				R	
lilac				R	

SPECIES CODE	LAYER 1	2	3	4	COLL.
goldenrod sp.				O	
Ench nightshade.				R	
fleabane.				R	✓
dandelion				R	

Page 7 of 16

Print Name: M STRAUS (Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature: (Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413694 Polygon No.: D.

Assessment Type: ☐-Visual; no access/☒-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
		See p. 2			

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	**Site Assessment**	**Photo ID**	**Map ID**	**UTM Coordinates**		
				Zone	**Easting**	**Northing**
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency					
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

none obs

Page 8 of 16

Print Name: MSTRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

ELC

COMMUNITY DESCRIPTION & CLASSIFICATION

SITE (project no./name): 1250 Gordon

POLYGON: E

SURVEYOR(S): M STRAUS.

DATE: June 6/18.

PHOTO No.:

START: 1430

END: 1450

ZONE & UTM:

POLYGON DESCRIPTION

SYSTEM
- ☒ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☒ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☒ MINERAL SOIL
- ☐ PARENT MIN.
- ☐ ACIDIC BEDRK.
- ☐ BASIC BEDRK.
- ☐ CARB. BEDRK.

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☒ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☒ NATURAL
- [✓ ☐ CULTURAL] Disturbed

COVER
- ☐ OPEN
- ☐ SHRUB
- ☒ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD.
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

2 large / > smaller

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1	4	S. Maple > TILAMER
2	SUB-CANOPY	2	4	TILAMER
3	UNDERSTOREY	5	2	RHACATH
4	GRD. LAYER	6-7	4	, Ench nightshade, goldenrod

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:

BA:

SIZE CLASS ANALYSIS:	R	<10	O	10 – 24	O	25 – 50	R	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	R	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE:		PIONEER		YOUNG		MID-AGE	✓	MATURE		OLD GROWTH

SOIL ANALYSIS:

TEXTURE:

DEPTH TO MOTTLES/GLEY g= G=

MOISTURE:

DEPTH OF ORGANICS: (cm)

HOMOGENEOUS / VARIABLE

DEPTH TO BEDROCK: (cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: **CODE:**

COMMUNITY SERIES: **CODE:**

ECOSITE: **CODE:**

VEGETATION TYPE: D-F S. Maple - Basswood **CODE:** Decid. Forest

INCLUSION **CODE:** FOD5-6

COMPLEX **CODE:**

Notes: (e.g. disturbance, surface water depths, etc.)

- no under story - overstory trees only + only approx a dozen trees or so.

- woodchips from cutting. regen g.c

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
TILAMER	A	A			
Sugar Maple	A				
PRUSER	R	R			
N. Spruce	R				
FRAAMER			n		
RHACATH			←AO		

SPECIES CODE	LAYER 1	2	3	4	COLL.
VITRIPA				O	
Ench. nightshade				A	
Burdock				R	
E. Cranberry (Ex TRI)				R	
yellow Avens				R	
virg creeper ~~[illegible]~~				O	
goldenrod sp.				O	
Woodsorrel				R	
RUDHIRT				R	
DAUCARO				R	
Healall				R	
Phil Fleabane				R	
Lactuca sp.				R-O	
Tall buttercup				R	
DACTGLOM				R	
Medica sp. (fuzzy, no flowers yet)				R	
garlic mustard				R	

Page 9 of 16

FOD that has been cut. canopy cover gap ≥ 20m ∴ only in adj woodland

Quality Control: This form is complete ☐ & legible ☐

Print Name: M STRAUS (Field Notes Author)

Signature: (Field Notes QA/QC personnel)

G:\01609\active\160961148\field_data\Terrestrial\field package\field_forms\ELC\elc_61148_66_bluewater_20170713.docx / (DERIVED FROM LEE ET AL., 1998)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 6 ka. 1250 Gordon

Polygon No.: E

Assessment Type: ☐-Visual; no access/☐-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
		See p. 2.			

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

White-tailed deer antler.

Wood Frog observed on July 5/18 visit.

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment		Photo ID	Map ID	UTM Coordinates		
					Zone	Easting	Northing
ALL SITES							
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)						
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate						
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows						
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size						
WOODLANDS							
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth	none obs					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency						
WETLANDS							
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency						
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature						
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys						

Page 10 of 16

Print Name: M STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2017-07-13

ELC

COMMUNITY DESCRIPTION & CLASSIFICATION

SITE (project no./name): 1250 Gordon.

POLYGON: F

SURVEYOR(S): M STRAUS

DATE: June 6/18

PHOTO No.:

START: 1500-

END: 1530

ZONE:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☒ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☒ MINERAL SOIL ☐ PARENT MIN. ☐ ACIDIC BEDRK. ☐ BASIC BEDRK. ☐ CARB. BEDRK.	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY, SLOPE ☐ TABLELAND ☒ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☒ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☒ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☒ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☒ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☒ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	Scotch Pine
2	SUB-CANOPY	3	4	Scotch Pine > [illegible]
3	UNDERSTOREY	4	4	RHACATH
4	GRD. LAYER	5-7	4	goldenrod > RHACATH,

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:

BA:

SIZE CLASS ANALYSIS:	O	<10	A	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	–	>50
DEADFALL/LOGS:	O	<10	O	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE: ☐ PIONEER ☐ YOUNG ☒ MID-AGE ☐ MATURE ☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE:

MOISTURE:

HOMOGENEOUS / VARIABLE

DEPTH TO MOTTLES/GLEY g= G=

DEPTH OF ORGANICS: (cm)

DEPTH TO BEDROCK: (cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS: CODE:

COMMUNITY SERIES: CODE:

ECOSITE: CODE:

VEGETATION TYPE: Scotch Pine Plantation CODE: CUR3-3

INCLUSION CODE:

COMPLEX CODE:

Notes: (e.g. disturbance, surface water depths, etc.)

Scotch Pine Plantation.

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Scotch Pine.	D	D			
THUOCC		R			
JUGNIGR	R	R			
RHACATH		R	O	A	
A. L dogwood				R	

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Ranunc. sp.				R	
L. Cranberry				R	
goldenrod sp.				O	
Devils paint brush				R	

Page 11 of 16

Print Name: M STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

G:\01609\active\160961148\field_data\Terrestrial\field package\field_forms\ELC\elc_61148_66_bluewater_20170713.docx / (DERIVED FROM LEE ET AL., 1998)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 1250 Gordon
Polygon No.: F

Assessment Type: ☐-Visual; no access/☒-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
		See	p 2		

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

black/grey squirrel.

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	**Site Assessment**	**Photo ID**	**Map ID**	**UTM Coordinates**		
				Zone	**Easting**	**Northing**
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size none obs.					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 12 of 16

Print Name: MSTRAUS.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible

Signature:
(Field Notes QA/QC personnel)

REV: 2017-07-1

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

Project Number: 61413684.
Date: June12/18.
Project Name: 1250 Gordon
Field Personnel: MSTRAUS.

Weather Conditions:

TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (in last 24 hrs):
15°C	6km/hr	0	0	0

POLYGON DESCRIPTION

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

POLYGON: 1
START TIME: 830
END TIME: 900

TOPOGRAPHIC FEATURE		HISTORY
☐ LACUSTRINE	☐ TALUS	☐ NATURAL
☐ RIVERINE	☐ CREVICE / CAVE	
☐ BOTTOMLAND	☐ ALVAR	☐ CULTURAL
☐ TERRACE	☐ ROCKLAND	
☐ VALLEY SLOPE	☐ BEACH / BAR	
☐ TABLELAND	☐ SAND DUNE	
☐ ROLL. UPLAND	☐ BLUFF	
☐ CLIFF		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	4	POPTREM >> THUOCCI
2	SUB-CANOPY	3	4	THUOCCI
3	UNDERSTOREY	4	4+	Glossy buckthorn.
4	GRD. LAYER	5-7	4	ferns

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60% N/O=not observed

STANDING SNAGS:	N/O <10	N/O 10 – 24	N/O 25 – 50	N/O >50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT N/O=Not observed

STAND MATURITY:	☐ PIONEER	☐ YOUNG	☐ MID-AGE	☒ MATURE	☐ OLD GROWTH

VEGETATION TYPE: Poplar-Conifer Mineral Mixed Swamp CODE: SWM3-2
☐ COMPLEX CODE:

Evidence of Disturbance / Notes:

- no standing water
- variable cover
- topography lowers to here.
- Abundant deadfall visible.

(no soils so could be Organic into centre - no access)

LAYERS: 1=CANOPY >10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT N/O=Not observed

SPECIES CODE	LAYER				DISTANCE FROM ~~RD~~ edge		COLL.
	1	2	3	4	≤5 m	>5 m	
TREES:							
POPTREM	D				✓	✓	
THUOCCI	O	A	O		✓	✓	
~~[illegible]~~							
Balsam Fir	R-O?					✓	
POPBALC	R-O?			?			
SHRUBS:							
Glossy Buckthorn.			O-A		✓	✓	
RHACATH			?				
EuropeanCranberry			?				
GROUND:							
Sensitive fern				O	✓	✓	
other ferns				O	✓	✓	
Viola sp.				R?			

Page 1 of 2
Print Name: MSTRAUS (Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐
Signature: (Field Notes QA/QC personnel)

CONTINUED SITE: 1250 Gordon. DATE: June12/18

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

ELC Polygon: # **Assessment Type:** ☐-Visual; no access / ☑-Walk through feature

Partial.

Extent of Physical Investigation of Feature: ☐-Entire / ☒-Partial, walk through polygon *(indicate on map)*

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

GCFL

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

none obs

Page 2 of 2

Print Name: MSTRAUS.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-14

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**	SITE (~~project no~~/name): 1250 Gordon			H
	SURVEYOR(S): M Straus		DATE: July 5/18	PHOTO No.:
	START: 10:00	END: 1100	ZONE & UTM:	

POLYGON DESCRIPTION

SYSTEM
- ☒ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☒ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN.
- ☐ ACIDIC BEDRK.
- ☐ BASIC BEDRK.
- ☐ CARB. BEDRK.

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☑ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☒ CULTURAL

COVER
- ☐ OPEN
- ☐ SHRUB
- ☒ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD.
- ☐ GRAMINOID
- ☐ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☒ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☐ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☒ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	2	JUGNIGR > ULMAMER
2	SUB-CANOPY	3	3	JUGNIGR >PINSYLV
3	UNDERSTOREY	4	3	JUGNIGR
4	GRD. LAYER	5-7	4	goldenrod, grape, grasses

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% [✓ 3=25<CVR≤60%] 4=CVR>60%

STAND COMPOSITION:

BA: HR only

SIZE CLASS ANALYSIS:	A	<10	R	10 – 24	O	25 – 50	R	>50
STANDING SNAGS:	N	<10	R	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE: ☒ PIONEER ☐ YOUNG ☐ MID-AGE ☐ MATURE ☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE:	DEPTH TO MOTTLES/GLEY	g=	G=
MOISTURE:	DEPTH OF ORGANICS:	(cm)	
HOMOGENEOUS / VARIABLE	DEPTH TO BEDROCK:	(cm)	

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:		CODE:
COMMUNITY SERIES:		CODE:
ECOSITE:		CODE:
VEGETATION TYPE:	D-F Black Walnut	CODE: WODM4-4
INCLUSION	Dec. Woodland.	CODE:
COMPLEX		CODE:

Notes: (e.g. disturbance, surface water depths, etc.)

Tiny (~ 45m x 35m) regen meadow. (no 1998 code)
-lude HR along houses - mature trees

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

HR only

SPECIES CODE	LAYER 1	2	3	4	COLL.
JUGNIGR.	R-O				
ULMAMER				R	
THUOCCI		R			
PINSYLV		R			
PRUAMER			R		
Crataegus sp. (cockspur)		R			
AL Dogwood			R		
PRUVIRG.			R		
LONTART			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
St. John's wort				R	
asparagus.				R	
BROINER.				R-O	
oxeye daisy				R	
kentucky Blue				O	
VITRIPA.				O-A	
vin creeper				O	
goldenrod sp.				A	
DACGLOM				O	

Page 15 of 16.

Print Name: M STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number:
Polygon No.:
Assessment Type: ☐-Visual; no access/☐-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 16 of 16

Print Name: L STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

Project Number: 61413684.
Date: July 5/18
Project Name: 1250 Gordon.
Field Personnel: W Straus

Weather Conditions:

TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (in last 24 hrs):
26.	0 - 1	0	0	0

feels like 40°C.

POLYGON DESCRIPTION

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

POLYGON: AA
START TIME: 11.30.
END TIME: 11 45

TOPOGRAPHIC FEATURE		HISTORY
☐ LACUSTRINE	☐ TALUS	☒ NATURAL
☐ RIVERINE	☐ CREVICE / CAVE	☐ CULTURAL
☒ BOTTOMLAND	☐ ALVAR	
☐ TERRACE	☐ ROCKLAND	
☐ VALLEY SLOPE	☐ BEACH / BAR	
☐ TABLELAND	☐ SAND DUNE	
☐ ROLL. UPLAND	☐ BLUFF	
☐ CLIFF		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY			
4	GRD. LAYER	5-7	4	Reed Canary, Cattails

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60% N/O=not observed

STANDING SNAGS:	N/O <10	N/O 10 – 24	N/O 25 – 50	N/O >50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT N/O=Not observed

STAND MATURITY:	☒ PIONEER	☐ YOUNG	☐ MID-AGE	☐ MATURE	☐ OLD GROWTH

VEGETATION TYPE: Reed-canary Grass Min.		CODE: MAM2-2
COMPLEX	Meadow Marsh.	CODE:

Evidence of Disturbance / Notes:

- marsh
- Cattail ?

- small pocket of cattail visible.
- not sure from distance dom. sp.

LAYERS: 1=CANOPY >10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT N/O=Not observed

SPECIES CODE	LAYER				DISTANCE FROM RD.		COLL.
	1	2	3	4	≤5 m	>5 m	
TREES:							
SHRUBS:							
GROUND:							
TYPLATI				O		✓	
Reed Canary				D.			

Page 1 of 6

Quality Control: This form is complete ☐ & legible ☐

Print Name: W STRAUS.
(Field Notes Author)

Signature:
(Field Notes QA/QC personnel)

V:\01609\resource\Internal Info and Teams\FIELD FORMS\Vegetation\ELC\roadside-elc-woodland-wildlife-habitat-form_rev02.docx / (DERIVED FROM LEE *ET AL.*, 1998)

CONTINUED SITE: 1250 Gordon DATE: July 5/18

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

ELC Polygon: #

Assessment Type: ☒-Visual; no access / ☐-Walk through feature

Extent of Physical Investigation of Feature: ☐-Entire / ☐-Partial, walk through polygon *(indicate on map)*

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)	Sub/emergent veg present Shrubs/logs at edge present Water permanency					
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

none obs

Page 2 of 6

Print name: M STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature: ____________________
(Field Notes QA/QC personnel)

REV: 2014-04-14

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

Project Number: 6014413689
Date: July 5/18.
Project Name: 1250 Gordon
Field Personnel: MSMAUS

Weather Conditions:

TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (in last 24 hrs):
26	0	0	0	

feels 40

POLYGON DESCRIPTION

ELC COMMUNITY DESCRIPTION & CLASSIFICATION			
POLYGON: AB	**TOPOGRAPHIC FEATURE**		**HISTORY**
START TIME: 1145.	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF	☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL
END TIME: 1200			

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	1	ULMAMER
2	SUB-CANOPY	3	0	?
3	UNDERSTOREY	4	3	Shrub
4	GRD. LAYER	5-7	4	cattails

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60% N/O=not observed

STANDING SNAGS:	A	<10	N/O	10 – 24	N/O	25 – 50	N/O	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT N/O=Not observed

STAND MATURITY:		PIONEER	X	YOUNG		MID-AGE		MATURE		OLD GROWTH

VEGETATION TYPE:	Cattail Mineral Shallow	CODE:	MAS2-1
COMPLEX	Marsh	CODE:	

Evidence of Disturbance / Notes:

- more cattail + dead/live shrubs

LAYERS: 1=CANOPY >10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT N/O=Not observed

SPECIES CODE	LAYER				DISTANCE FROM RD.		COLL.
	1	2	3	4	≤5 m	>5 m	
TREES:							
ULMAMR.	R.					✓	
SHRUBS:							
?						✓	
GROUND:							
Cattails						✓	

Page 3 of 6
Print Name: MSMAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐
Signature:
(Field Notes QA/QC personnel)

CONTINUED SITE: 1250 Gordon DATE: July 5/18. **Roadside ELC, Woodland & Wildlife Habitat Assessment Form**

ELC Polygon: # **Assessment Type:** ☒-Visual; no access / ☐-Walk through feature **Extent of Physical Investigation of Feature:** ☐-Entire / ☐-Partial, walk through polygon *(indicate on map)*

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

none

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows 6 ls					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size none					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 4 of 6

Print Name: MSparks.
(Field Notes Author)

Quality Control: **This form is complete** ☐ **& legible** ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-14

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

Project Number: 61413684
Project Name: 1250 Gordon
Date: July 5/18
Field Personnel: M STRAUS

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (in last 24 hrs):
	26	0-1	0	0	0

feels like 40

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

POLYGON: AC
START TIME: 1145.
END TIME: 1200.

POLYGON DESCRIPTION

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☐ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☒ CULTURAL

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4.	Pinus sp.
2	SUB-CANOPY	3		?
3	UNDERSTOREY	4		
4	GRD. LAYER	5-7		

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60% N/O=not observed

STANDING SNAGS: ☒ <10 ☐ 10 – 24 ☐ 25 – 50 ☐ >50
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT N/O=Not observed

STAND MATURITY: ☐ PIONEER ☐ YOUNG ☒ MID-AGE ☐ MATURE ☐ OLD GROWTH

VEGETATION TYPE: Coniferous Plantation CODE: CUP3
☐ COMPLEX CODE:

Evidence of Disturbance / Notes:

- Scotch/pine plant~ → (red pine in bigger?). w regen edge.
- includes 2nd pocket

LAYERS: 1=CANOPY >10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT N/O=Not observed

SPECIES CODE	LAYER				DISTANCE FROM RD.		COLL.
	1	2	3	4	≤5 m	>5 m	
TREES:							
PINSYLV	D						
BETPAPY	R						
PIN RES?	D						
SHRUBS:							
?							
GROUND:							
?							

Page 5 of 6

Print Name: MSTRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

CONTINUED SITE: 1250 Gordon DATE: July 5/18

Roadside ELC, Woodland & Wildlife Habitat Assessment Form

ELC Polygon: # **Assessment Type:** ☒-Visual; no access / ☐-Walk through feature **Extent of Physical Investigation of Feature:** ☐-Entire / ☐-Partial, walk through polygon *(indicate on map)*

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

none obs

Page 6 of 6

Quality Control: **This form is complete ☐ & legible ☐**

Print Name: M STRAUS.
(Field Notes Author)

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-14

ELC COMMUNITY DESCRIPTION & CLASSIFICATION			
SITE (~~project no.~~/name): 1250 Gordon		POLYGON: G.	
SURVEYOR(S): L STRAUS		DATE: Sept 11/18	PHOTO No.:
START: 11 AM	END: 12 pm	ZONE & UTM:	

POLYGON DESCRIPTION

SYSTEM
- ☑ TERRESTRIAL
- ☐ WETLAND
- ☐ AQUATIC

SITE
- ☐ OPEN WATER
- ☐ SHALLOW WATER
- ☑ SURFICIAL DEP.
- ☐ BEDROCK

SUBSTRATE
- ☐ ORGANIC
- ☑ MINERAL SOIL
- ☐ PARENT MIN.
- ☐ ACIDIC BEDRK.
- ☐ BASIC BEDRK.
- ☐ CARB. BEDRK.

TOPOGRAPHIC FEATURE
- ☐ LACUSTRINE
- ☐ RIVERINE
- ☐ BOTTOMLAND
- ☐ TERRACE
- ☐ VALLEY SLOPE
- ☐ TABLELAND
- ☑ ROLL. UPLAND
- ☐ CLIFF
- ☐ TALUS
- ☐ CREVICE / CAVE
- ☐ ALVAR
- ☐ ROCKLAND
- ☐ BEACH / BAR
- ☐ SAND DUNE
- ☐ BLUFF

HISTORY
- ☐ NATURAL
- ☑ CULTURAL

COVER
- ☑ OPEN
- ☐ SHRUB
- ☐ TREED

PLANT FORM
- ☐ PLANKTON
- ☐ SUBMERGED
- ☐ FLOATING-LVD.
- ☐ GRAMINOID
- ☑ FORB
- ☐ LICHEN
- ☐ BRYOPHYTE
- ☐ DECIDUOUS
- ☐ CONIFEROUS
- ☐ MIXED

COMMUNITY
- ☐ LAKE
- ☐ POND
- ☐ RIVER
- ☐ STREAM
- ☐ MARSH
- ☐ SWAMP
- ☐ FEN
- ☐ BOG
- ☐ BARREN
- ☑ MEADOW
- ☐ PRAIRIE
- ☐ THICKET
- ☐ SAVANNAH
- ☐ WOODLAND
- ☐ FOREST
- ☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	Scotch Pine
2	SUB-CANOPY	3	3	JUGNIGR > Scotch Pine
3	UNDERSTOREY	4-5	3	Silver Poplar
4	GRD. LAYER	6-7	4	goldenrod, MELALBA,

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

STAND COMPOSITION:								BA:
SIZE CLASS ANALYSIS:	O	<10	RO	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	N	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	R	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE: ☐ PIONEER ☑ YOUNG ☐ MID-AGE ☐ MATURE ☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE: S lo	DEPTH TO MOTTLES/GLEY	g= >30	G= >30
MOISTURE: 3 or 4	DEPTH OF ORGANICS:	3 (cm)	
[✓ HOMOGENEOUS] / VARIABLE	DEPTH TO BEDROCK:	>30 (cm)	

← check hydro-g log.

can only excavate to 30cm before hit rock.

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:	CODE:
COMMUNITY SERIES:	CODE:
ECOSITE:	CODE:
VEGETATION TYPE: Cultural Meadow	CODE: CUM1
☐ INCLUSION	CODE:
☐ COMPLEX	CODE:

Notes: (e.g. disturbance, surface water depths, etc.)
Disturbed (lots of dumping) Cum w̄ regen FOR to west + south.

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
PINSYLV	R	O			
Silver Poplar			O		
JUGNIGR.					
THUOCCI		R			
Lilac			R		
RUBSTRI				R	
CONTART			R		
RHACATH			O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
RUDTRI?				R	
RUPHART				R	
SOLCANA				D	
BROINER				O	
~~[illegible]~~ Indian Hemp					
Melilotus sp.				O	
DAUCARO				R-O	
VICCRACC				R-O	
NE Aster				R	
ULTREPA				R-O	

Page 13 of 16.

Print Name: L STRAUS
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature: ____________
(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: G

Polygon No.: 614.13684

Assessment Type: ☐-Visual; no access/☑-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:	TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
	17°C	11Km/hr	50%.	0	Rain.

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

- Eastern Cottontail
- BCCH

onsite

Wren? (chattering).

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 14 of 16

Print Name: M STRAUS
(Field Notes Author)

Quality Control: **This form is complete ☐ & legible ☐**

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-1

ELC **COMMUNITY DESCRIPTION & CLASSIFICATION**			
SITE (project no./name): 1250 Gordon.		**POLYGON:** I	
SURVEYOR(S): M STRAUS.		**DATE:** Sept 11/18	**PHOTO No.:**
START:	**END:**	**ZONE & UTM:**	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☑ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☑ MINERAL SOIL ☐ PARENT MIN. ☐ ACIDIC BEDRK. ☐ BASIC BEDRK. ☐ CARB. BEDRK.	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☑ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☑ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☑ WOODLAND ☐ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WATER ☑ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☑ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	4	N. Spruce > THUOCCI
2	SUB-CANOPY	3	4	THUOCCI
3	UNDERSTOREY	4	4	RHACATH
4	GRD. LAYER	5-7	2-4	avens, buckthorn, periwinkle, garlic mustard

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

↳ variable - dense trees little gc.

STAND COMPOSITION:

BA:

SIZE CLASS ANALYSIS:	A	<10	R	10 – 24	O	25 – 50	D	>50
STANDING SNAGS:	N/O	<10	R	10 – 24	R	25 – 50	R	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	R	25 – 50	N/O	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

COMM. AGE: ☒ PIONEER ☐ YOUNG ☐ MID-AGE ☒ MATURE ☐ OLD GROWTH

SOIL ANALYSIS:

TEXTURE: Si	**DEPTH TO MOTTLES/GLEY**	g= > 45	G= >45	
MOISTURE: 3	**DEPTH OF ORGANICS:**	2		(cm)
[✓ **HOMOGENEOUS**] / **VARIABLE**	**DEPTH TO BEDROCK:**	>45.		(cm)

COMMUNITY CLASSIFICATION:

COMMUNITY CLASS:		**CODE:**
COMMUNITY SERIES:		**CODE:**
ECOSITE:		**CODE:**
VEGETATION TYPE: Naturalized Coniferous Hedge-		**CODE:** FOCM5.
☐ **INCLUSION**	mineral CUM?? [illegible]	**CODE:**
☐ **COMPLEX**		**CODE:**

Notes: (e.g. disturbance, surface water depths, etc.)

Series of hedgerows. Connected + incor. Residence veg to an extent

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
N. Spruce	A				
THUOCCI	O	O			
Silver Maple	R.				
QUERUBR.		R			
PINSTRO	R	R			
POPDELT	R				
Silver Poplar	/	R			
Horse Chestnut		R			
N Maple	R				
LL Linden		R.			
Betula sp.		?			
RHACATH					

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COLL.
Japanese Knotweed			R		
E. Cranberry				R	
Avens.				R	
periwinkle				D	
garlic mustard				D	

Page 1 of 2

Print Name: M STRAUS.
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Wildlife Habitat Assessment Form

Project Number: 61413684 Polygon No.: "I"

Assessment Type: ☐-Visual; no access/☐-Entire; walk through feature/☐-Partial access *(indicate on map)*

Weather Conditions:

TEMP (°C):	WIND:	CLOUD:	PPT:	PPT (last 24 hrs):
17	11 km/hr	50	0	Rain

NOTES & SPECIES OBSERVATIONS (list species and type of observation, indicate on map):

- Squirrel - OB (black).
- AMRO - OB (FY).

CA=carcass; DP=distinctive parts; FE=feeding evidence; FY=eggs/nest; HO=house/den; OB=observed; SC=scat; SI=other sign; TK=track; VO=vocalization

Wildlife Habitat Type & Description	Site Assessment	Photo ID	Map ID	UTM Coordinates		
				Zone	Easting	Northing
ALL SITES						
Bat Hibernacula: Caves, abandoned mines, underground foundations, karst features	Size of opening(s) Bedrock Type Depth of feature (if possible)					
Snake Hibernacula: Burrows, rock crevices, fissures that extend below the frost line (i.e. at least 1 m)	Number of access points Size of opening(s) Substrate					
Bank / Cliff Colonial Bird Nesting Habitat: Exposed soil banks, undisturbed, naturally eroding, steep slopes, cliff faces with evidence of nests or burrows	Size of burrow Number of burrows					
Stick Nests: Stick nests found in any forest/ woodland/swamp; includes heron colonies and bald eagle/ osprey/other raptor nests	Tree species Nest size					
WOODLANDS						
Vernal Pools: Permanent or semi-permanent pool or pond. Evidence of holding water in most years through late spring (i.e. late May) or into summer	Number of features Feature size (diameter) Water depth Sub/emergent veg present Shrubs/logs at edge present Water permanency					
Seeps and Springs: Locations where groundwater comes to the surface in forests (see document for indicator species)						
WETLANDS						
Turtle Wintering Areas: Permanent water bodies, large wetlands, bogs, or fens with soft substrates and deep enough not to freeze solid	Feature size (diameter) Water depth Substrate of water body Water permanency					
Turtle Nesting Habitat: Exposed mineral soil (sand or gravel) areas adjacent (<100 m) to MAM/SA/BOO/ FEO (note if man-made)	Type of substrate Distance to wetland Size of feature					
Terrestrial Crayfish Habitat: Edges of shallow marshes and meadows (no minimum size) with crayfish chimneys	Number of chimneys					

Page 2 of 2

Print Name: M Straus
(Field Notes Author)

Quality Control: This form is complete ☐ & legible ☐

Signature:
(Field Notes QA/QC personnel)

REV: 2014-04-17

Active construction in prev ag field behind here

Stantec

Legend
- Study Area (120 m)
- Site Boundary
- Municipal Boundary, Lower

Potential Bat Habitat
- Building
- Tree

DRAFT- FOR FIELD USE

0 25 50 Metres

1:1,200 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Service Layer Credits: © 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution Airbus DS Image Date: Unknown

Project Location
City of Guelph

161413684 REVA
Prepared by DH on 2018-06-05
Technical Review by ABC on yyyy-mm-dd
Independent Review by ABC on yyyy-mm-dd

Client/Project
TRICAR
1250 GORDON

Figure No.
1

Title
Field Map- Bats

V:\01609\active_Other_PCs_Active\614 - London\161413648\03_data\gis_cad\Figures\Terrestrial\FieldMaps\161413684_Field_Map_Bats.mxd Revised: 2018-06-05 By: dharvey

APPENDIX H.2
REPTILES

Stantec

Reptile Survey

Project No: 161413684
Project Name: 1250 Gordon
Date: July 5, 2018
Personnel: M. Straus

Weather Conditions:	TEMP (°C)	WIND	CLOUD	PPT	PPT (last 24-hrs)
	26	1	0	0	0

Reptile Species Observed

Location			Time		Species	Habitat Description	Other Notes
Zone	Easting	Northing	Start	End			
					None observed	House - no entries/cracks into foundation for hibernacula observed	9 Valley Rd.
					↓	↓	1260 Gordon St.
							↳ did not approach 1242 and 1250 Gordon St - Dogs barking.

PAGE 1 OF 1

Print Name & Initial: ____________________
(field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial: ____________________
(field notes QA/QC personnel)

Stantec

Reptile Survey

Project No: 16141368 4
Project Name: 1250 Gordon
Date: November 23, 2018
Personnel: K. Zipfer

Weather Conditions:	3	2	10%	—	—
	TEMP (°C)	WIND	CLOUD	PPT	PPT (last 24-hrs)

Reptile Species Observed

Location			Time		Species	Habitat Description	Other Notes
Zone	Easting	Northing	Start	End			
—	—	—	—	—	None observed	House/residential. No cracks observed in foundation	1242 Gordon St.
—	—	—	—	—	↓	House/residential. No cracks observed in foundation	1250 Gordon St.

PAGE 1 OF 1

Print Name & Initial:

(field notes author)

Quality Control: This form is complete ☐ & legible ☐

Print Name & Initial:

(field notes QA/QC personnel)

APPENDIX H.3
AMPHIBIANS

Stantec Consulting Ltd.
1 – 70 Southgate Drive
Guelph, ON
Canada N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Amphibian Call Survey Observation Form

Project Number: 1614 13684
Project Name: Tricar 1250 Gordon
Date: May 7 /2018
Field Personnel: D. Eusebi

Weather Conditions:	TEMP (°C): 16°	WIND: 0	CLOUD: Clear	PPT: None	PPT (in last 24 hrs): None

Record start time at each station

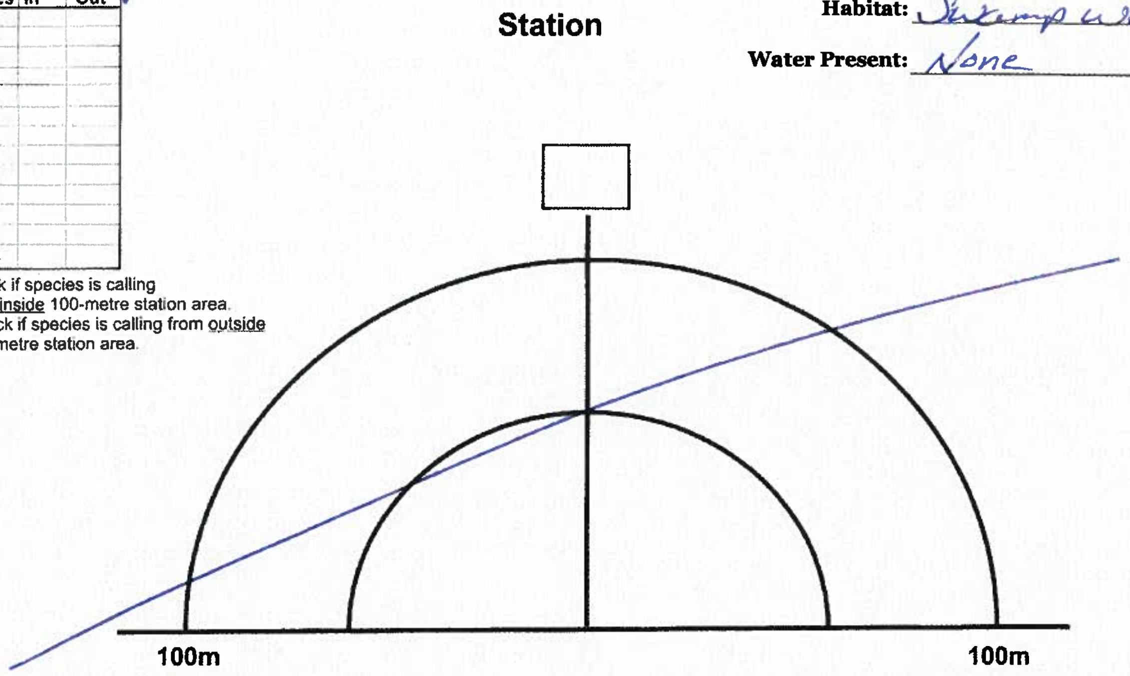
Visit No.:	Start Time:	End Time:
1	9:21	9:26

No Calling

Start Time: 9:21
UTM: 435163 802012
Habitat: Swamp wetland
Water Present: None

Species	In*	Out**
AMTO		
BCFR		
BULL		
CHFR		
CGTR		
FOTO		
GRTR		
GRFR		
MIFR		
NLFR		
PIFR		
SPPE		
WOFR		

* Check if species is calling from inside 100-metre station area.
** Check if species is calling from outside 100-metre station area.



Page 1 of 1

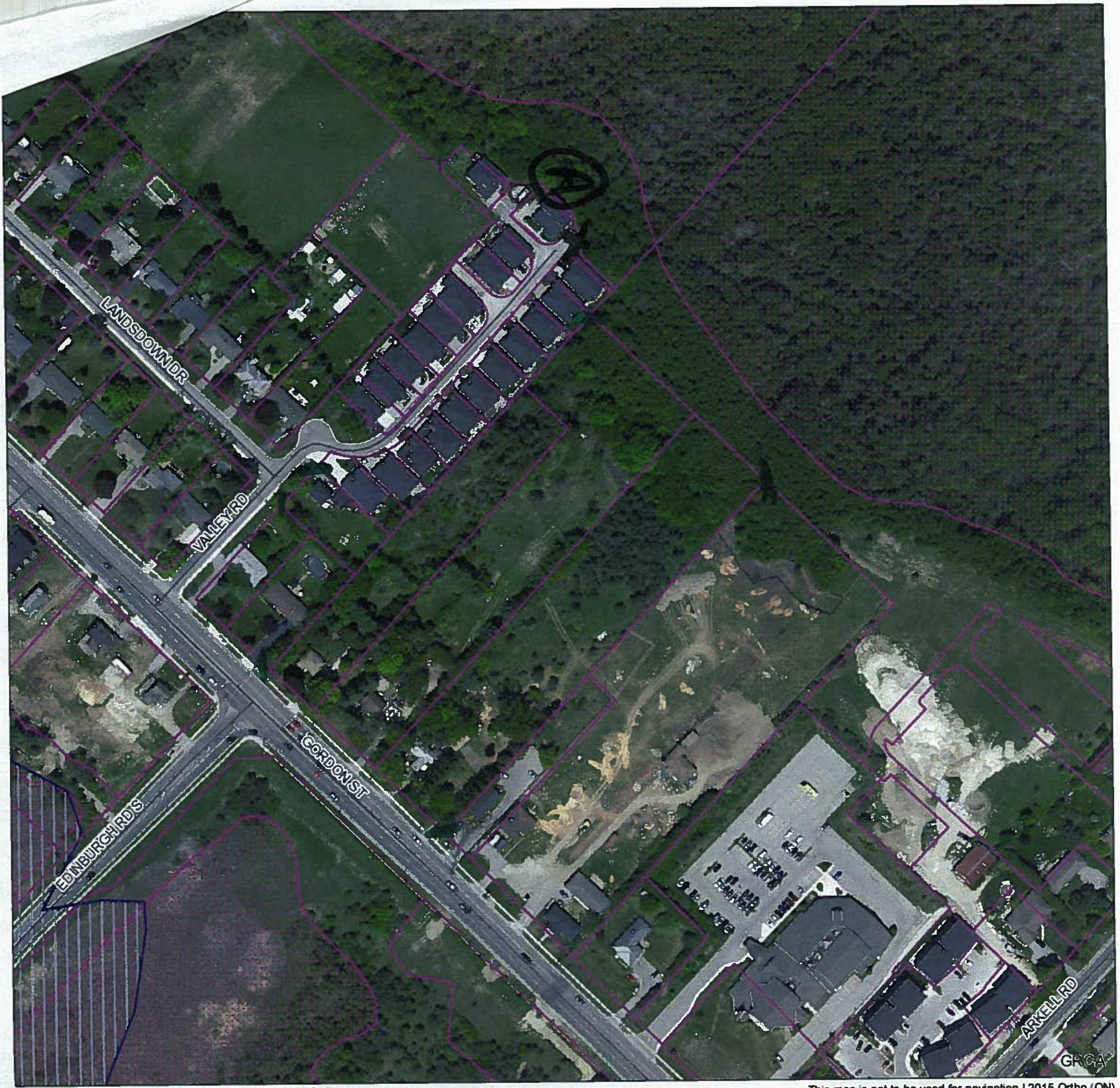
Signature: Daniel Eusebi
(Field Personnel)

Quality Control: This form is complete ☐ & legible ☐.

Signature:
(Project Manager)

Grand River Conservation Authority

Date: May 04, 2018



Map Centre (UTM NAD83 z17): 564,574.00 4,818,537.12

This map is not to be used for navigation | 2015 Ortho (ON)

Legend

- 🟨 Regulation Limit (GRCA)
- ∼ Regulated Watercourse (GRCA)
- 🟦 Regulated Waterbody (GRCA)
- ▦ Wetland (GRCA)
- Floodplain (GRCA)
  - ▧ Engineered
  - ▨ Estimated
  - ◫ Approximate
  - ▨ Special Policy Area
- Slope Valley (GRCA)
  - 🟨 Steep
  - 🟩 Oversteep
  - 🟨 Steep
- Slope Erosion (GRCA)
  - 🟨 Oversteep
  - 🟫 Toe
- 🟥 Lake Erie Flood (GRCA)
- ⬜ Lake Erie Shoreline Reach (GRCA)
- 🟨 Lake Erie Dynamic Beach (GRCA)
- 🟩 Lake Erie Erosion (GRCA)
- ⬜ Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

Disclaimer: This map is for illustrative purposes only. Information contained herein is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.

The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to: https://maps.grandriver.ca/Sources-and-Citations.pdf

0 15 30 60 90 Metres

N

NAD 1983 UTM Zone 17N

Scale: 2,808

APPENDIX H.5
BAT SUVERYS

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost -
Bat Maternity Roost Habitat Assessment Data Form

Project Number: 161413684

Project Name: 1250 Gordon Street Guelph

May 11, 2018	10:00		Madalie Benner.
DATE	TIME (start)	TIME (end)	Field Personnel

Weather Conditions:

1	11°	1-2	90%	No	No
FEATURE #	TEMP (°C)	WIND	CLOUD	PPT	PPT (in last 24 hrs)

NOTES ABOUT ENTIRE FEATURE

Age/Maturity: Mature tree stand with primarily cedars, some younger trees.

Dominant tree species: Cedar, Black Cherry, Sugar Maple, Norway Maple,

How common are suitable bat roosting trees outside of removal area?
Not very common, Trees are relatively healthy and in good condition with the exception of the few noted as bat cavity trees. Most cavities were less than 10m.

RECORD TREES >10 CM DBH WITH CAVITIES LOCATED IN REMOVAL AREA BELOW

Tree No.	Species	Notes	DBH (cm) (>10cm only)	Tree height (m)	Cavity Height (m)	Photo Number(s)	UTM (Zone: 17T)	One of tallest trees in community	Exhibits cavities /crevices/scars/woodpe	Largest DBH in community	Cavity or crevice is high up in tree (>10 m)	Within highest density or cluster of cavity trees	Large amount of loose, peeling bark	Open canopy	Early stages of decay (class 1-3)
EX	Sugar maple		40	12	9	1, 2	123456 / 1234567	X		X			X		X
1	Unknown	Large scar/cavity that appears to extend upward in tree	54	19	2-4	4-8	564543 / 4818457	X	X						2
2	Oak	Large cavity in hollow tree, scar, main stem broken	24	10	3	12-14	564546 / 4818453		X						2

Quality Control:This form is complete ☐ & legible ☐.

Signature: ____________________
(Field Personnel)

Signature: ____________________
(Project Manager)

Tree No.	Species	Notes	DBH (cm) (>10cm only)	Tree height (m)	Cavity Height (m)	Photo Number(s)	UTM (Zone: 17T)	One of tallest trees in community	Exhibits cavities /crevices/scars/woodpecker holes	Largest DBH in community	Cavity or crevice is high up in tree (>10 m)	Within highest density or cluster of cavity trees	Large amount of loose, peeling bark	Open canopy	Early stages of decay (class 1-3)
3	Black cherry	Tree dying at top, no bark at top, bark peeling @ middle of tree	22	14.5	N/A	15,16	564648 / 4818560						X		3
4	Spruce	Main stem broken, various cavities	43	20	4-5	17-21	564631 / 4818563	X	X						1
5	Sugar Maple	Knot w cavity facing slightly upwards, very healthy	71	23	8	22-24	564610 / 4818591	X	X					X	1
6	Sugar Maple	Cavity where 2 main stems separate & 1 more where branch broke	73	22	4-5	25-28	564608 / 4818589	X	X					X	1
7	Unknown	Dead, numerous cavities & woodpecker holes, lots of peeling bark	61	20	7-10	29-33	564561 / 4818514		X		X		X	X	2-3
8	Maple	Large cavity on lower half of tree	101	22	2.5	34,35	564526 / 4818445	X	X	X				X	
9	Unknown	Main stem broken, cavity	39	10	8	36,37	564500 / 4818449		X						4
10	Norway Maple.	Healthy tree w cavity	58	16	5	38,39	564481 / 4818429		X					X	1
11	Norway Maple	Various cavities in knots.	51	15	5-7	40-45	564485 / 4818419		X					X	1
							/								
							/								
							/								
							/								
							/								
							/								
							/								

Quality Control:This form is complete ☐ & legible☐.

Signature: Maddie B

(Field Personnel)

Signature:

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost Building Habitat Assessment Data Form

Project Number: 1614 13685

Project Name: Tricar - 1250 Gordon

DATE	TIME (start)	TIME (end)	Field Personnel
June 12/2018	20:30	22:00	D Euseb

Weather Conditions:

TEMP (°C)	WIND	CLOUD	PPT	PPT (in last 24 hrs)
24 °C	11km (2)	100%	-	Zero

Building #	Exterior building material	State of Building Repair	Visible potential roost exits?	Direction where exits face	Bats observed (if yes, incl. # observed)	Photo # (s)	UTM (Zone:___)	Bat guano observed	Roof shape	Attic present
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
1	Wood Siding	Very Poor	Facia & others	East	N	-	-	N	Peaked	Yes.
							/			
							/			
							/			

Signature:
(Field Personnel)

Quality Control: This form is complete ☑ & legible ☑.
Signature:
(Project Manager)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost Building Habitat Assessment Data Form

Project Number: 161413685

Project Name: Tricar 1250 Gorda

DATE	TIME (start)	TIME (end)	Field Personnel
June 12, 2018	20 30	22:00	A. Taylor

Weather Conditions:

TEMP (°C)	WIND	CLOUD	PPT	PPT (in last 24 hrs)
24°C	3	100%	/	/

Buildin g #	Exterior building material	State of Building Repair	Visible potential roost exits?	Direction where exits face	Bats observed (if yes, incl. # observed)	Photo # (s)	UTM (Zone:____)	Bat guano observed	Roof shape	Attic present
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
2	Panel siding	poor	-holes -vents to attic	N, W, S		/	/	/	peaked	-small crawl space at peak above 2nd floor
							/			
							/			
							/			

Signature:
(Field Personnel)

Quality Control: This form is complete ☑ & legible ☑.

Signature:
(Project Manager)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost Building Habitat Assessment Data Form

Project Number: 161413684

Project Name: 1250 Gordon St.

DATE	TIME (start)	TIME (end)	Field Personnel
June 12, 2018	20:45	10:00	K. Zupfer

Weather Conditions:

TEMP (°C)	WIND	CLOUD	PPT	PPT (in last 24 hrs)
24°C	11 km/h SW	100%	–	–

Building #	Exterior building material	State of Building Repair	Visible potential roost exits?	Direction where exits face	Bats observed (if yes, incl. # observed)	Photo # (s)	UTM (Zone:____)	Bat guano observed	Roof shape	Attic present
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
3	Brick	Moderate/ Poor	cracks	S	N	–	N / A SM3-11	N	Peaked	N
							/			
							/			
							/			

Signature:
(Field Personnel)

Quality Control:This form is complete ☑ & legible ☑

Signature:
(Project Manager)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost Building Habitat Assessment Data Form

Project Number: 161413685

Project Name: Tricar 1250 Gordon

DATE	TIME (start)	TIME (end)	Field Personnel
12 June 2018	8:30 pm	10:00 pm	Melissa Cameron

Weather Conditions:

TEMP (°C)	WIND	CLOUD	PPT	PPT (in last 24 hrs)
24°C	2 - 3	100%	0	0

Building #	Exterior building material	State of Building Repair	Visible potential roost exits?	Direction where exits face	Bats observed (if yes, incl. # observed)	Photo # (s)	UTM (Zone:____)	Bat guano observed	Roof shape	Attic present
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
4	House - brick Shed 1 - wood Shed 2 - metal	House - good Shed 1 - mod. Shed 2 - mod.	House - vent ? Shed 1 - loose soffit Shed 2 - open	- SE - NW	Y (12) N N		/	N N N	peaked low peak low peak	Y N N
							/			
							/			
							/			

Signature: Melissa Cam
(Field Personnel)

Quality Control:This form is complete ☑ & legible ☑.

Signature:
(Project Manager)

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost ~~Building~~ Tree Habitat Assessment Data Form

Project Number: 1614 13648

Project Name: Tricar - ~~[illegible]~~ 1250 Gordon

June 13	8:30	10:00	Daniel Eusebio
DATE	TIME (start)	TIME (end)	Field Personnel

Weather Conditions:

21°		2-3	5%	Zero	thunderstorms
TEMP (°C)		WIND	CLOUD	PPT	PPT (in last 24 hrs)

Building #	**Exterior building material**	**State of Building Repair**	**Visible potential roost exits?**	**Direction where exits face**	**Bats observed (if yes, incl. # observed)**	**Photo # (s)**	**UTM (Zone:____)**	**Bat guano observed**	**Roof shape**	**Attic present**
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
Tree 9	N/A.	Cavities	Cavities	All	None	N/A	/	No	N/A	N/A
							/			
							/			
							/			

Signature: Daniel Eusebio
(Field Personnel)

Quality Control:This form is complete ☑ & legible ☑.

Signature:
(Project Manager)

Stantec

Stantec Consulting Ltd.
70 Southgate Drive, Suite 1, Guelph, ON N1G 4P5
Tel: (519) 836-6050
Fax: (519) 836-2493

Bat Maternity Roost Building Habitat Assessment Data Form

Project Number: ~~1614~~161413648

Project Name: 1250 Gordon

DATE	TIME (start)	TIME (end)	Field Personnel
June 13, 2018	20:30	22:00	N. Taylor

Weather Conditions:

TEMP (°C)		WIND	CLOUD	PPT	PPT (in last 24 hrs)
20°C	17°C	2-3	0/	0	T-Storms

Building #	**Exterior building material**	**State of Building Repair**	**Visible potential roost exits?**	**Direction where exits face**	**Bats observed (if yes, incl. # observed)**	**Photo # (s)**	**UTM (Zone:___)**	**Bat guano observed**	**Roof shape**	**Attic present**
EX	Stucco, vinyl siding, brick etc.	Good, moderate, poor, very poor	(e.g. visible holes, cracks, peak of roof, vents, loose soffit, loose seams in fascia, other)	North, west, east or south side of building	Y (4) /N	1, 2	123456 / 1234567	Y/N	Peaked, flat	Y/N
Tree 10	N/A	N/A	Cavities	N/A	N	/	/	N	N/A	N/A
Tree 11	N/A	N/A	Cavities	N/A	N	/	/	N	N/A	N/A
Building #1	wood siding	moderate	1 old vent w visible opening?	E	N	/	/	N	Peak	N
							/			

Signature: NTaylor
(Field Personnel)

Quality Control:This form is complete ☐ & legible ☐.

Signature: Daniel
(Project Manager)

APPENDIX H.6
BREEDING BIRDS

Stantec

Breeding Bird Survey Observation Form

Project Number: 161413684

Date: June 12/18

Project Name: 1250 Gordon

Field Personnel: MStrauss

Weather Conditions: 15°C TEMP (°C) | 6km/h E WIND | 0 CLOUD | 0 PPT (current) | 0 PPT (last 24 hrs)

Habitat No.	ELC Code(s) or Habitat Descriptions	TIME (HH:mm)	
		Start	End
A	9 Valley Dr	800	8:15
B	Meadow (transect @ 8:45-9 Am.)	8:15	10:00
C	Cedar Forest + Offsite	8:25	10:00
D	Plantation + woodland	8:05	10:00
E	Res on Gordon	900	9:30
X	Offsite	800	10:00

Breeding Evidence (BE) Codes (Breeding Bird Atlas of Ontario - http://www.birdsontario.org/atlas/codes.jsp?lang=en)

OBSERVED

X Species observed in its breeding season (no breeding evidence)

POSSIBLE

H Species observed in its breeding season in suitable nesting habitat

S Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

PROBABLE

M At least 7 individuals singing or producing other sounds associated with breeding (e.g., calls or drumming), heard during the same visit to a single square and in suitable nesting habitat during the species' breeding season

P Pair observed in suitable nesting habitat in nesting season

T Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code

D Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation

V Visiting probable nest site

A Agitated behaviour or anxiety calls of an adult

B Brood Patch on adult female or cloacal protuberance on adult male

N Nest-building or excavation of nest hole, except by a wren or a woodpecker

CONFIRMED

NB Nest-building or excavation of nest hole by a species other than a wren or a woodpecker

DD Distraction display or injury feigning

NU Used nest or egg shells found (occupied or laid during the survey)

FY Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight

AE Adult leaving or entering nest sites in circumstances indicating occupied nest

FS Adult carrying fecal sac

CF Adult carrying food for young

NE Nest containing eggs

NY Nest with young seen or heard

PAGE 1 OF 2

Print Name & Initial: MSTRAUS (field notes author)

Quality Control: This form is complete ☑ & legible ☑

Print Name & Initial: (field notes QA/QC personnel)

CONTINUED SITE: 1250 Gordon DATE: June 12/18 Breeding Bird Survey Observation Form

Record location of all significant species on site map

Species	Habitats	BE*	Species	Habitats	BE*	Species	Habitats	BE*
Can. Goose			Red-bellied Wo.			**Gold-wing. Wa** † Ω**		
Wood Du. Ω			**Yell-bellied Sap. ‡ Ω**			Nashville Wa.		
Am. Black Duck Ω			Downy Wo.			Yellow Wa.		
Mallard Ω	B	Flyover	Hairy Wo.			Chestnut-s. Wa.		
R. N. Pheasant			**No. Flicker †**	B	S	**Magnolia Wa. ‡**		
Ruffed Grouse ‡			**Pileated Wo. ‡ Ω**			**Bl-thr Blue Wa. ‡ Ω**		
W. Turkey			**Ea. Wood-Pewee **†**	E(86)	S	**Yel-rumped Wa. ‡**		
Co. Loon ‡ Ω			Alder Fly.			**Bl-thr Gr. Wa. ‡ Ω**		
Pied-b. Grebe Ω			**Willow Fly. † Ω**			**Blackburnian Wa. ‡ Ω**		
D. C. Cormorant ‡			Least Fly.			**Pine Wa. ‡**		
Am. Bittern Ω			Ea. Phoebe			**Cerulean Wa** †‡ Ω**		
Least Bittern ‡**			Gr. Crested Fly.			**Bl-and-wh Wa. ‡**		
Gr. B. Heron Ω			**Ea. Kingbird †**			**Am. Redstart ‡**		
Gr. Egret Ω			**Yellow-thr. Vireo ‡**			**Ovenbird ‡ Ω**		
Green Heron Ω			**Blue-headed Vireo ‡ Ω**			**No. Waterthrush ‡**		
T. Vulture			Warbling Vireo			**Mourning Wa. ‡**		
Osprey Ω			Red-eyed Vireo	B, C, D	S	Co. Yellowthroat		
N. Harrier †‡ Ω			Blue Jay	D, C, E	A	**Hooded Wa†‡****		
Sharp-sh. Hawk ‡ Ω			Am. Crow			**Canada Wa. †‡** Ω**		
Coopers Hawk ‡ Ω			Co. Raven			**Scarlet Tanager ‡ Ω**		
Red-shou. Hawk †‡ Ω			Horned Lark			**Eastern Towhee † Ω**		
Red-tailed Hawk			Purple Mart.			Chipping Sp.	E, B, D.	S
Am. Kestrel †			Tree Swallow			**Clay-colored Sp. Ω**		
Virginia Rail Ω			**No. R. W. Swal. Ω**			**Field Sp. † Ω**		
Sora Ω			**Bank Swallow †** Ω**			**Vesper Sp. † Ω**		
Killdeer			**Cliff Swallow Ω**			**Savannah Sp. † Ω**		
Spot. Sandpiper			**Barn Swallow****			**Grasshopper Sp. †** Ω**		
Upla. Sandpiper ‡ Ω			Bl-capped Chickadee	C, B	S, H	Song Sp.	B	S
Wilson's Snipe			Tufted Titmouse			Swamp Sp.		
Am. Woodcock			**Red-br. Nuthatch Ω**			**Wh-throated Sp. ‡**		
Ring-b. Gull			Wh-br. Nuthatch			No. Cardinal	B, E	A
Herring Gull			**Br. Creeper ‡**			**Rose-br. Grosbeak †**		
Caspian Tern			Carolina Wren.			Indigo Bunt.	D, C	S
Black Tern ‡ Ω**			House Wren	X	S	**Bobolink †****		
Common Tern			**Winter Wren ‡ Ω**			Red-winged Bl.	C(86)	S
Rock Dove			**Sedge Wren Ω**			**Ea. Meadowlark †****		
Mourn. Dove			**Marsh Wren Ω**			Co. Grackle	A	H
Yellow-b Cuckoo			**Golded-cr. Kinglet ‡**			Br-headed Cow.		
Black-b Cuckoo † Ω			**B. G. Gnatcatcher ‡**			Orchard Oriole		
Ea. Screech Owl			Ea. Bluebird			**Baltimore Oriole †**		
Gr. Horned Owl			**Veery Ω**			Purple Finch		
Barred Owl ‡ Ω			**Hermit Thrush ‡**			House Finch		
Long-eared Owl			**Wood Thrush †****			Pine Siskin		
No. Saw-whet Owl			Am. Robin	X, O, B, E	FY, AE	Am. Goldfinch	A, E	S
Co. Nighthawk**			Gray Catbird			House Sparrow		
Whip-poor-will †‡**			No. Mockingbird			Other Species ...		
Chimney Swift †**			**Br. Thrasher † Ω**					
Yellow-b Cuckoo			European Starling	E	H			
Black-b Cuckoo † Ω			Cedar Waxwing					
Ea. Screech Owl			**Blue-wing. Wa. †**					

* Record highest Breeding Evidence (BE) observed over all habitat. Use codes as in Breeding Bird Atlas of Ontario (see opposite side of this page).
** Endangered, Threatened or Special Concern
† Partners In Flight
‡ Area Sensitive Species
Ω Significant Wildlife Habitat Indicator

- Black (grey) squirrel
- red squirrel nest

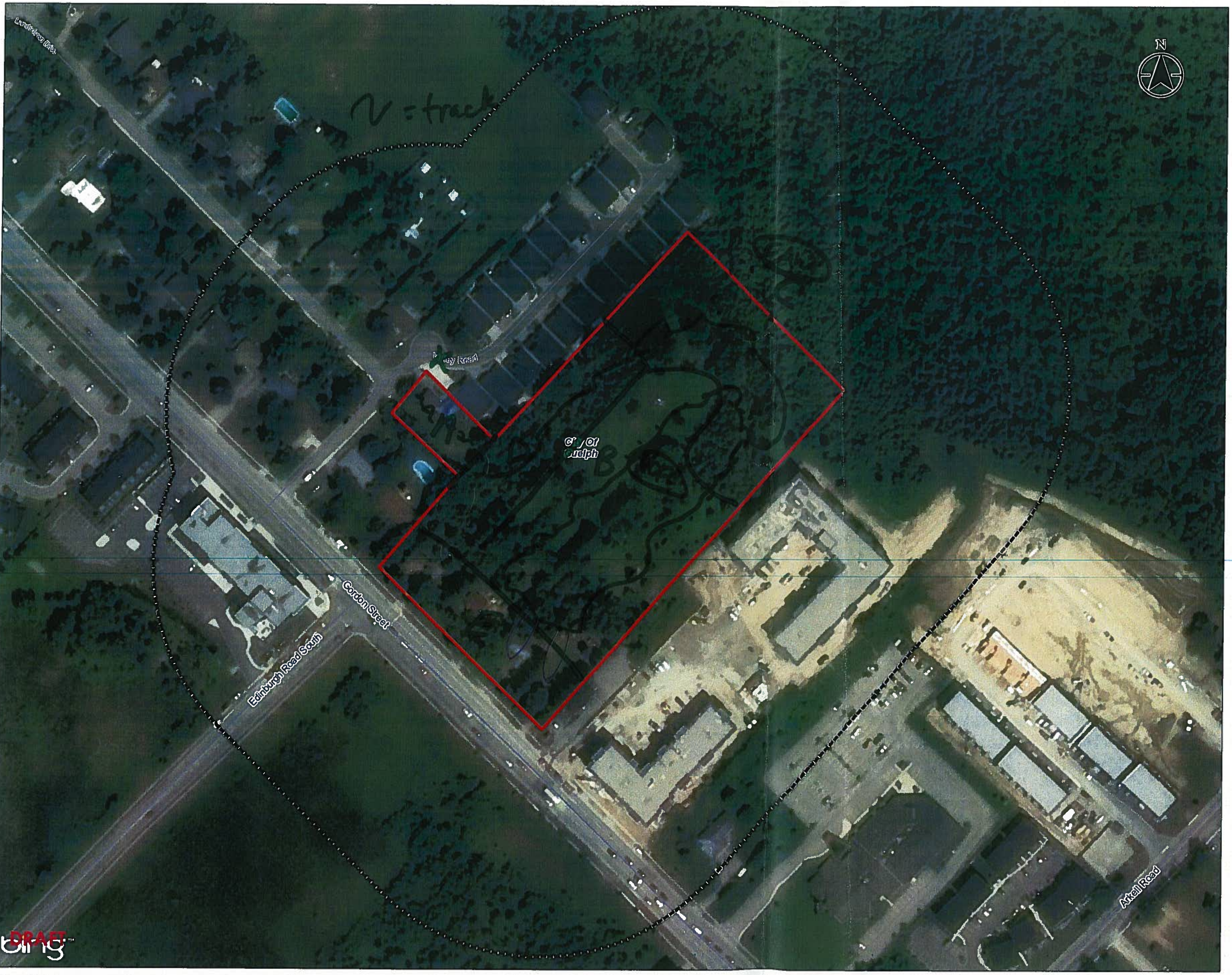
PAGE 2 OF 2

Print Name & Initial: MSTRAUC MAS
(field notes author)

Quality Control: This form is complete ☑ & legible ☑
Print Name & Initial:
(field notes QA/QC personnel)

FORM 031 / REV: 2015-05-28

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\Figures\Terrestrial\FieldMaps\16143684_Field_Map.mxd Revised: 2018-05-28 By: dharvey



Stantec

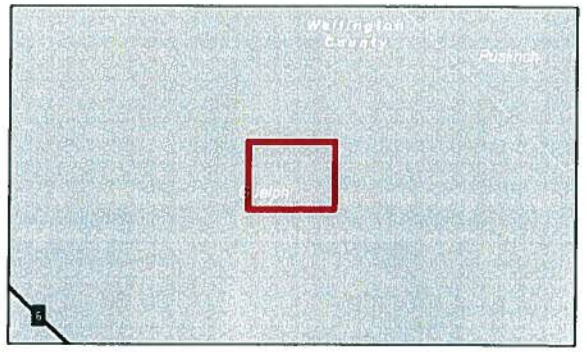
Legend
▭ Study Area (120 m)
🟥 Site Boundary
▭ Municipal Boundary, Lower

Breeding Birds
Round 1

June 12, 2018

0 50 100 Metres
1:2,100 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Service Layer Credits: © 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution Airbus DS Image Date: Unknown



Project Location
City of Guelph

161413684 REVA
Prepared by DH on 2018-05-28
Technical Review by ABC on yyyy-mm-dd
Independent Review by ABC on yyyy-mm-dd

Client/Project
TRICAR
1250 GORDON

Figure No.
1

DRAFT

Title
Field Map

Stantec

Breeding Bird Survey Observation Form

Project Number: 1614136~~88~~ 84
Date: July 5/18
Weather Conditions: 23°C Feels like 26. (TEMP (°C)) 0-1 (WIND) 0 (CLOUD) 0 (PPT (current)) 0 (PPT (last 24 hrs))

Project Name: 1250 Gordon
Field Personnel: M Strauss

Habitat No.	ELC Code(s) or Habitat Descriptions	TIME (HH:mm)	
		Start	End
A	Res - Valley	745.	10:00
B	Res - Gordon	9:30	10:00
C	Meadow	8:00	10:00
D	Meadow	8:00	10:00
E	woods including Plantations + woodland ptRs	8:00	10:00

Breeding Evidence (BE) Codes (Breeding Bird Atlas of Ontario - http://www.birdsontario.org/atlas/codes.jsp?lang=en)

OBSERVED

- **X** Species observed in its breeding season (no breeding evidence)

POSSIBLE

- **H** Species observed in its breeding season in suitable nesting habitat
- **S** Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

PROBABLE

- **M** At least 7 individuals singing or producing other sounds associated with breeding (e.g., calls or drumming), heard during the same visit to a single square and in suitable nesting habitat during the species' breeding season
- **P** Pair observed in suitable nesting habitat in nesting season
- **T** Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code
- **D** Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation
- **V** Visiting probable nest site
- **A** Agitated behaviour or anxiety calls of an adult
- **B** Brood Patch on adult female or cloacal protuberance on adult male
- **N** Nest-building or excavation of nest hole, except by a wren or a woodpecker

CONFIRMED

- **NB** Nest-building or excavation of nest hole by a species other than a wren or a woodpecker
- **DD** Distraction display or injury feigning
- **NU** Used nest or egg shells found (occupied or laid during the survey)
- **FY** Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight
- **AE** Adult leaving or entering nest sites in circumstances indicating occupied nest
- **FS** Adult carrying fecal sac
- **CF** Adult carrying food for young
- **NE** Nest containing eggs
- **NY** Nest with young seen or heard

PAGE 1 OF 2
Print Name & Initial: M Strauss
(field notes author)

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial:
(field notes QA/QC personnel)

CONTINUED SITE: 1250 Gordon DATE: July 5/18

Breeding Bird Survey
Observation Form

Record location of all significant species on site map

Species	Habitats	BE*	Species	Habitats	BE*	Species	Habitats	BE*
Can. Goose			Red-bellied Wo.			**Gold-wing. Wa** †Ω**		
Wood Du. Ω			**Yell-bellied Sap. ‡Ω**			Nashville Wa.		
Am. Black Duck Ω			Downy Wo.			Yellow Wa.		
Mallard Ω			Hairy Wo.	E	S	Chestnut-s. Wa.		
R. N. Pheasant			**No. Flicker †**			**Magnolia Wa. ‡**		
Ruffed Grouse ‡			**Pileated Wo. ‡Ω**			**Bl-thr Blue Wa. ‡Ω**		
W. Turkey			**Ea. Wood-Pewee **†**			**Yel-rumped Wa. ‡**		
Co. Loon ‡Ω			Alder Fly.			**Bl-thr Gr. Wa. ‡Ω**		
Pied-b. Grebe Ω			**Willow Fly. †Ω**			**Blackburnian Wa. ‡Ω**		
D. C. Cormorant ‡			Least Fly.			**Pine Wa. ‡**		
Am. Bittern Ω			Ea. Phoebe			**Cerulean Wa** †‡Ω**		
Least Bittern ‡**			Gr. Crested Fly.	E(OH)	S	**Bl-and-wh Wa. ‡**		
Gr. B. Heron Ω			**Ea. Kingbird †**			**Am. Redstart ‡**		
Gr. Egret Ω			**Yellow-thr. Vireo ‡**			**Ovenbird ‡Ω**		
Green Heron Ω			**Blue-headed Vireo ‡Ω**			**No. Waterthrush ‡**		
T. Vulture			Warbling Vireo			**Mourning Wa. ‡**		
Osprey Ω			Red-eyed Vireo	E	S	Co. Yellowthroat		
N. Harrier †‡Ω			Blue Jay			**Hooded Wa†‡****		
Sharp-sh. Hawk ‡Ω			Am. Crow			**Canada Wa. †‡** Ω**		
Coopers Hawk ‡Ω			Co. Raven			**Scarlet Tanager ‡Ω**		
Red-shou. Hawk †‡Ω			Horned Lark			**Eastern Towhee †Ω**		
Red-tailed Hawk			Purple Mart.			Chipping Sp.		
Am. Kestrel †			Tree Swallow			**Clay-colored Sp. Ω**		
Virginia Rail Ω			**No. R. W. Swal. Ω**			**Field Sp. †Ω**		
Sora Ω			**Bank Swallow †** Ω**			**Vesper Sp. †Ω**		
Killdeer			**Cliff Swallow Ω**			**Savannah Sp. †Ω**		
Spot. Sandpiper			**Barn Swallow****	E	OH	**Grasshopper Sp. †** Ω**		
Upla. Sandpiper ‡Ω			Bl-capped Chickadee			Song Sp.		
Wilson's Snipe			Tufted Titmouse			Swamp Sp.		
Am. Woodcock			**Red-br. Nuthatch Ω**			**Wh-throated Sp. ‡**		
Ring-b. Gull			Wh-br. Nuthatch	E	S	No. Cardinal	E,D	S
Herring Gull			**Br. Creeper ‡**			**Rose-br. Grosbeak †**		
Caspian Tern			Carolina Wren.			Indigo Bunt.	D	S
Black Tern ‡Ω**			House Wren			**Bobolink †****		
Common Tern			**Winter Wren ‡Ω**			Red-winged Bl.		
Rock Dove			**Sedge Wren Ω**			**Ea. Meadowlark †****		
Mourn. Dove			**Marsh Wren Ω**			Co. Grackle	E	H
Yellow-b Cuckoo			**Golded-cr. Kinglet ‡**			Br-headed Cow.		
Black-b Cuckoo †Ω			**B. G. Gnatcatcher ‡**			Orchard Oriole		
Ea. Screech Owl			Ea. Bluebird			**Baltimore Oriole †**		
Gr. Horned Owl			**Veery Ω**			Purple Finch		
Barred Owl ‡Ω			**Hermit Thrush ‡**			House Finch		
Long-eared Owl			**Wood Thrush †****			Pine Siskin		
No. Saw-whet Owl			Am. Robin	E	S	Am. Goldfinch	A,D	P,S
Co. Nighthawk**			Gray Catbird			House Sparrow		
Whip-poor-will †‡**			No. Mockingbird			Other Species ...		
Chimney Swift †**			**Br. Thrasher †Ω**					
Yellow-b Cuckoo			European Starling					
Black-b Cuckoo †Ω			Cedar Waxwing					
Ea. Screech Owl			**Blue-wing. Wa. †**					

* Record highest Breeding Evidence (BE) observed over all habitat. Use codes as in Breeding Bird Atlas of Ontario (see opposite side of this page).
** Endangered, Threatened or Special Concern
† Partners In Flight
‡ Area Sensitive Species
Ω Significant Wildlife Habitat Indicator

PAGE 2 OF 2

Print Name & Initial: M STRAUS MAS
(field notes author)

Quality Control: This form is complete ☐ & legible ☐
Print Name & Initial:
(field notes QA/QC personnel)

V:\01609\active_Other_PCs_Active\614 - London\161413684\03_data\gis_cad\figures\Terrestrial\FieldMaps\161413684_Field_Map.mxd Revised: 2018-05-28 By: dharvey

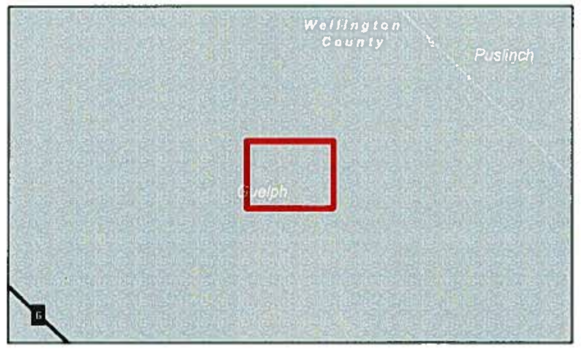
Stantec

Legend
- Study Area (120 m)
- Site Boundary
- Municipal Boundary, Lower

0 50 100 Metres

1:2,100 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Service Layer Credits: © 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution Airbus DS Image Date: Unknown



Project Location
City of Guelph

161413684 REVA
Prepared by DH on 2018-05-28
Technical Review by ABC on yyyy-mm-dd
Independent Review by ABC on yyyy-mm-dd

Client/Project
TRICAR
1250 GORDON

Figure No.
1

DRAFT

Title
Field Map

APPENDIX H.7
BUTTERFLY AND DRAGONFLY

1250 Gordon
161413684
Field staff - Andrew Taylor

Aug 15/18
3:15 - 4:45

20°C Wind - 1 Cloud - 20%

Odonata

White-faced meddowhawk
12-spotted skimmer
Ruddy-faced meadowhawk
Lance-tipped Darner
Common Spreadwing

Butterflies

Cabbage White
Clouded sulphur
Northern Crescent
Silvery blue
Monarch
Red-spotted Purple

Bumble Bees

Eastern Bumble bee
Tri-colored " "
Half Black " "

APPENDIX I
PLANT AND WILDLIFE LISTS

APPENDIX I.1
PLANT LIST

Family[1]	Scientific Name[1]	Common Name[1]	Species Code[3,4]	Establishment Means[1]	Coefficient of Conservatism[3]	Wetness Index[3]	Wetland Plant Species[3]	Weediness Index[3]	Provincial Status[2,4]	SARO Status[2]	COSEWIC Status[3]	Global Status[2]	City of Guelph
Onocleaceae	*Onoclea sensibilis*	sensitive fern	ONOSENS	native	4	-3	I		S5			G5	
Cupressaceae	*Juniperus virginiana virginiana*	eastern red cedar	JUNVIRG	native		-?			S5			G5	
Cupressaceae	*Thuja occidentalis*	eastern white cedar	THUOCCI	native	4	-3	T		S5			G5	
Pinaceae	*Abies balsamea*	balsam fir	ABIBALS	native	5	-3	T		S5			G5	
Pinaceae	*Abies sp.*												
Pinaceae	*Larix laricina*	tamarack	LARLARI	native	7	-3	I		S5			G5	
Pinaceae	*Picea abies*	Norway spruce	PICABIE	introduced		5		-1	SE3			G5	
Pinaceae	*Picea glauca*	white spruce	PICGLAU	native	6	3	T		S5			G5	
Pinaceae	*Picea pungens*	blue spruce	PICPUNG	introduced		-?			SE1			G5	
Pinaceae	*Pinus sp.*												
Pinaceae	*Pinus sylvestris sylvestris*	Scotch pine	PINSYLV	introduced		5		-3	SE5			GNR	
Apiaceae	*Daucus carota*	wild carrot	DAUCARO	introduced		5		-2	SE5			GNR	
Apocynaceae	*Vinca minor*	lesser periwinkle	VINMINO	introduced		5		-2	SE5			GNR	
Asteraceae	*Arctium minus*	common burdock	ARCMINU	introduced		5		-2	SE5			GNR	
Asteraceae	*Centaurea stoebe micranthos*	spotted knapweed	CENBIEB	introduced		5		-3	SE5			GNR	
Asteraceae	*Cirsium arvense*	Canada thistle	CIRARVE	introduced		3		-1	SE5			GNR	
Asteraceae	*Cirsium vulgare*	bull thistle	CIRVULG	introduced		4		-1	SE5			GNR	
Asteraceae	*Erigeron philadelphicus philadelphicus*	Philadelphia fleabane	ERIPHIL	native	1	-3	T		S5			G5	
Asteraceae	*Erigeron sp.*												
Asteraceae	*Lactuca sp.*												
Asteraceae	*Leucanthemum vulgare*	oxeye daisy	LEUVULG	introduced		5		-1	SE5			GNR	
Asteraceae	*Rudbeckia hirta pulcherrima*	black-eyed Susan	RUDHIRT	native	0	3			-?	-?		-?	
Asteraceae	*Rudbeckia triloba triloba*	brown-eyed Susan	RUDTRIL	introduced		1		-1	SE4			G5	
Asteraceae	*Solidago canadensis canadensis*	Canada goldenrod	SOLCANA	native	1	3			-?	-?		-?	
Asteraceae	*Solidago flexicaulis*	zigzag goldenrod	SOLFLEX	native	6	3			S5			G5	
Asteraceae	*Solidago sp.*												
Asteraceae	*Symphyotrichum ericoides ericoides*	white heath aster	SYMERER	native		-?			-?	-?		-?	
Asteraceae	*Symphyotrichum lateriflorum lateriflorum*	calico aster	SYMLATE	native	3	-2	T		S5			G5	
Asteraceae	*Symphyotrichum novae-angliae*	New England aster	SYMNOVA	native	2	-3			S5			G5	
Asteraceae	*Taraxacum officinale*	common dandelion	TAROFFI	introduced		3		-2	SE5			G5	
Betulaceae	*Betula papyrifera*	paper birch	BETPAPY	native		2	T		S5			G5	
Betulaceae	*Betula pendula*	weeping birch	BETPEND	introduced		-4	T	-3	SE4			GNR	
Betulaceae	*Betula sp.*												
Brassicaceae	*Alliaria petiolata*	garlic mustard	ALLPETI	introduced		0		-3	SE5			GNR	
Caprifoliaceae	*Lonicera tatarica*	Tartarian honeysuckle	LONTATA	introduced		3		-3	SE5			GNR	
Caryophyllaceae	*Silene vulgaris*	bladder campion	SILLATI	introduced		-?			SE5			GNR	

Family[1]	Scientific Name[1]	Common Name[1]	Species Code[3,4]	Establishment Means[1]	Coefficient of Conservatism[3]	Wetness Index[3]	Wetland Plant Species[3]	Weediness Index[3]	Provincial Status[2,4]	SARO Status[2]	COSEWIC Status[3]	Global Status[2]	City of Guelph
Convolvulaceae	*Convolvulus arvensis*	field bindweed	CONARVE	introduced		5		-1	SE5			GNR	
Cornaceae	*Cornus alternifolia*	alternate-leaved dogwood	CORALTE	native	6	5			S5			G5	
Cornaceae	*Cornus stolonifera*	red-osier dogwood	CORSERI	native	2	-3	I*		S5			G5	
Elaeagnaceae	*Elaeagnus angustifolia*	Russian olive	ELAANGU	introduced		4		-1	SE3			GNR	
Fabaceae	*Gleditsia triacanthos*	honey locust	GLETRIA	native	3	0			S2			G5	
Fabaceae	*Lotus corniculatus*	garden bird's-foot trefoil	LOTCORN	introduced		1		-2	SE5			GNR	
Fabaceae	*Medicago lupulina*	black medick	MEDLUPU	introduced		1		-1	SE5			GNR	
Fabaceae	*Melilotus sp.*												
Fabaceae	*Trifolium pratense*	red clover	TRIPRAT	introduced		2		-2	SE5			GNR	
Fabaceae	*Vicia cracca*	tufted vetch	VICCRAC	introduced		5		-1	SE5			GNR	
Fagaceae	*Quercus rubra*	northern red oak	QUERUBR	native	6	3			S5			G5	
Hypericaceae	*Hypericum perforatum perforatum*	common St. John's-wort	HYPPERF	introduced		5		-3	SE5			GNR	
Juglandaceae	*Juglans cinerea*	butternut	JUGCINE	native	6	2			S3?	END	END	G4	X
Juglandaceae	*Juglans nigra*	black walnut	JUGNIGR	native	5	3			S4			G5	
Lamiaceae	*Clinopodium vulgare*	wild basil	CLIVULG	native	4	5			S5			G5	
Lamiaceae	*Mentha sp.*												
Malvaceae	*Tilia americana*	basswood	TILAMER	native	4	3			S5			G5	
Malvaceae	*Tilia sp.*												
Oleaceae	*Fraxinus americana*	white ash	FRAAMER	native	4	3			S4			G5	
Oleaceae	*Fraxinus pennsylvanica*	red ash	FRAPENN	native	3	-3	T		S4			G5	
Oleaceae	*Syringa vulgaris*	common lilac	SYRVULG	introduced		5		-2	SE5			GNR	
Onagraceae	*Circaea canadensis canadensis*	Canada enchanter's nightshade	CIRCANA	native	3	3			S5			G5T5	
Onagraceae	*Oenothera sp.*												
Oxalidaceae	*Oxalis montana*	common wood-sorrel	OXALACM	native	-?	-?	-?	-?	S5		?	G5	
Rhamnaceae	*Frangula alnus*	glossy buckthorn	RHAFRAN	introduced		-1	T	-3	SE5			GNR	
Rhamnaceae	*Rhamnus cathartica*	European buckthorn	RHACATH	introduced		3	T	-3	SE5			GNR	
Rosaceae	*Amelanchier sp.*												
Rosaceae	*Crataegus crus-galli crus-galli*	cockspur hawthorn	CRACRUS	native	4	0			S5			G5	
Rosaceae	*Crataegus sp.*												
Rosaceae	*Fragaria virginiana glauca*	smooth wild strawberry	FRAVIRG	native	2	1			S5			G5	
Rosaceae	*Geum aleppicum*	yellow avens	GEUALEP	native	2	-1	T		S5			G5	
Rosaceae	*Geum canadense*	white avens	GEUCANA	native	3	0	T		S5			G5	
Rosaceae	*Malus baccata*	Siberian crabapple	MALBACC	introduced		-?			SE1			GNR	
Rosaceae	*Malus coronaria*	sweet crabapple	MALCORO	native	5	5			S4			G5	
Rosaceae	*Malus sp.*												

Family[1]	Scientific Name[1]	Common Name[1]	Species Code[3,4]	Establishment Means[1]	Coefficient of Conservatism[3]	Wetness Index[3]	Wetland Plant Species[3]	Weediness Index[3]	Provincial Status[2,4]	SARO Status[2]	COSEWIC Status[3]	Global Status[2]	City of Guelph
Rosaceae	*Prunus serotina serotina*	black cherry	PRUSERO	native	3	3			S5			G5	
Rosaceae	*Prunus virginiana virginiana*	chokecherry	PRUVIRG	native	2	1			S5			G5	
Rosaceae	*Pyrus communis*	common pear	PYRCOMM	introduced		5		-1	SE4			G5	
Salicaceae	*Populus alba*	white poplar	POPALBA	introduced		5		-3	SE5			G5	
Salicaceae	*Populus balsamifera*	balsam poplar	POPBALS	native	4	-3	T		S5			G5	
Salicaceae	*Populus deltoides deltoides*	eastern cottonwood	POPDEDE	native	4	-1	T		-?	-?		-?	
Salicaceae	*Populus tremuloides*	trembling aspen	POPTREM	native		0	T		S5			G5	
Salicaceae	*Salix ×fragilis*	hybrid white willow	-?	introduced	-?	-?	-?	-?	-?	-?	-?	-?	
Salicaceae	*Salix sp.*												
Sapindaceae	*Acer ×freemanii*	Freeman maple	-?	native	-?	-?	-?	-?	-?	-?	-?	-?	
Sapindaceae	*Acer negundo*	Manitoba maple	ACENEGU	native	0	-2	T		S5			G5	
Sapindaceae	*Acer nigrum*	black maple	ACENIGR	native	7	3			S4?			G5	X
Sapindaceae	*Acer platanoides*	Norway maple	ACEPLAT	introduced		5		-3	SE5			GNR	
Sapindaceae	*Acer rubrum*	red maple	ACERUBR	native	4	0	T		S5			G5	
Sapindaceae	*Acer saccharinum*	silver maple	ACESACI	native	5	-3	I		S5			G5	
Sapindaceae	*Acer saccharum*	sugar maple	ACESACC	native	4	3			S5			G5	
Sapindaceae	*Aesculus hippocastanum*	horse chestnut	AESHIPP	introduced		5		-1	SE2			GNR	
Ulmaceae	*Ulmus americana*	white elm	ULMAMER	native	3	-2	T		S5			G5?	
Ulmaceae	*Ulmus pumila*	Siberian elm	ULMPUMI	introduced		5		-1	SE3			GNR	
Ulmaceae	*Ulmus rubra*	slippery elm	ULMRUBR	native	6	0			S5			G5	
Vitaceae	*Parthenocissus quinquefolia*	Virginia creeper	PARQUIN	native	6	1			S4?			G5	
Vitaceae	*Vitis riparia*	riverbank grape	VITRIPA	native	0	-2			S5			G5	
Asparagaceae	*Asparagus officinalis*	garden asparagus	ASPOFFI	introduced		3		-1	SE5			G5?	
Asparagaceae	*Maianthemum canadense canadense*	wild lily-of-the-valley	MAICANA	native	5	0			S5			G5	
Poaceae	*Agrostis sp.*												
Poaceae	*Bromus inermis*	smooth brome	BROINER	introduced		5		-3	SE5			G5TNR	
Poaceae	*Dactylis glomerata*	orchard grass	DACGLOM	introduced		3		-1	SE5			GNR	
Poaceae	*Phleum pratense pratense*	common timothy	PHLPRAT	introduced		3		-1	SE5			GNR	
Poaceae	*Poa pratensis pratensis*	Kentucky bluegrass	POAPRPR	introduced	0	1			-?	-?		-?	

1. Brouillet L, Desmet P, Coursol F, Meades SJ, Favreau M, Anions M, Bélisle P, Gendreau C, Shorthouse D, and contributors (2010+). Database of Vascular Plants of Canada (VASCAN). Online at http://data.canadensys.net/vascan and http://www.gbif.org/dataset/3f8a1297-3259-4700-91fc-acc4170b27ce, released on 2010-12-10. Version [xx]. GBIF key: 3f8a1297-3259-4700-91fc-acc4170b27ce. Data paper ID: doi: http://doi.org/10.3897/phytokeys.25.3100 [accessed on April 18, 2016]
2. Ontario Ministry of Natural Resources and Forestry. 2015. Ontario Vascular Plants. Online at from https://www.ontario.ca/page/get-natural-heritage-information. Accessed on May 3, 2016.
3. Newmaster, S. G., A. Lehela, Peter W. C. Uhlig, Sean McMurray and Michael J. Oldham. 1998. Ontario Plant List. Forest Research Information Paper No. 123, Ontario Forest Research Institute, Ontario Ministry of Natural Resources, Sault Ste. Marie, Ontario
4. Bradley, David J. 2013. Southern Ontario Vascular Plant Ppecies List, 3rd Edition. Ontario Ministry of Natural Resources and Forestry Southern Science & Information Section. Peterborough, Ontario.

Summary

Species Diversity			
Vascular Plants Listed:		100	
Identified to species or ssp/var		85	
Identified to Genus (not included in calculations below)		15	
Provincial Status		**Total Number**	**Percentage**
S1-S3 Species:	rare in Ontario	2	2%
S4 Species:	uncommon in Ontario	6	7%
S5 Species:	common in Ontario	34	40%
Other:		36	42%
Not listed:		0	0%
Not defined ("-?"):		7	8%
Means of Establishment			
Native Species:		47	55%
Introduced Species:		38	45%
Not listed:		0	0%
Not defined ("-?"):		0	0%
Co-efficient of Conservatism (C) and Floristic Quality Index (FQI)			
C 0 to 3	lowest sensitivity	18	21%
C 4 to 6	moderate sensitivity	22	26%
C 7 to 8	high sensitivity	2	2%
C 9 to 10	highest sensitivity	0	0%
Not listed:		40	47%
Not defined ("-?"):		3	4%
Average C		3.7	
FQI		45.5	
Presence of Weedy & Invasive Species			
weediness = 0	Not invasive	0	0%
weediness = -1	low potential invasiveness	15	18%
weediness = -2	moderate potential invasiveness	7	8%
weediness = -3	high potential invasiveness	11	13%
Not listed:		49	58%
Not defined ("-?"):		3	4%
Average weediness		-1.9	

Wetness Index			
upland	W of 5	20	24%
facultative upland	W of 4, 3 or 2	24	28%
facultative	W of 1, 0 or -1	18	21%
facultative wetland	W of -2, -3 or -4	15	18%
obligate wetland	W of -5	0	0%
Not listed:		0	0%
Not defined ("-?"):		8	9%
Average wetness value		1.7	
Presence of Wetland (W) Species			
Total Wetland Tolerant (T) Plant Species as identified in OWES Manual		18	21%
Total Wetland Indicator (I) Plant Species as identified in OWES Manual		4	5%
Not listed:		60	71%
Not defined ("-?"):		3	4%

APPENDIX I.2
WILDLIFE LIST

1242, 1250, 1260 Gordon Street and 9 Valley Road, Guelph, ON – Environmental Impact Study

Appendix I2 Wildlife List

COMMON NAME	***SCIENTIFIC NAME***	**ONTARIO STATUS**	**GLOBAL STATUS**	**SARO**	**SARA**	**AREA SENSITIVITY (ha)**	***Locally Significant (Guelph)***
ODONATA							
Common Speadwing	*Lestes disjunctus*	S5	G5				
Lance-Tipped Darner	*Aeshna constricta*	S5	G5				
Twelve-Spotted Skimmer	*Libellula pulchella*	S5	G5				
White-faced Meadowhawk	*Sympetrum obtrusum*	S5	G5				
Ruby Meadowhawk	*Sympetrum rubicundulum*	S5	G5				
BUTTERFLIES							
Cabbage White	*Pieris rapae*	SNA	G5				
Clouded Sulphur	*Colias philodice*	S5	G5				
Silvery Blue	*Glaucopsyche lygdamus*	S5	G5				
Northern Crescent	*Phycoides pascoensis*	S5	G5				
Red-spotted Purple	*Limenitis arthemis astyanax*	S5	G5T5				
Common Ringlet	*Coenonympha tullia*	S5	G5				
Monarch	*Danaus plexippus*	S4B, S2N	G5	SC	SC		
BUMBLE BEES							
Common Eastern Bumble Bee	*Bombus impatiens*	S4S5	G5				
Tri-colored Bumble Bee	*Bombus ternarius*	S5	GNR				
Half-black Bumble Bee	*Bombus vagans*	S5	GNR				
AMPHIBIANS							
Tetraploid Gray Treefrog	*Hyla versicolor*	S5	G5				
Wood Frog	*Lithobates sylvatica*	S5	G5				
REPTILES							
Eastern Gartersnake	*Thamnophis sirtalis*	S5	G5				
Red-bellied Snake	*Storeria occipitomaculata*	S5	G5				x
BIRDS							
Mallard	*Anas platyrhynchos*	S5	G5				
Yellow-billed Cuckoo	*Coccyzus americanus*	S4B	G5				x
Hairy Woodpecker	*Dryobates villosus*	S5	G5			10	x
Northern Flicker	*Colaptes auratus*	S4B	G5				

COMMON NAME	***SCIENTIFIC NAME***	**ONTARIO STATUS**	**GLOBAL STATUS**	**SARO**	**SARA**	**AREA SENSITIVITY (ha)**	***Locally Significant (Guelph)***
Pileated Woodpecker	*Dryocopus pileatus*	S5	G5			30-50*	x
Eastern Wood-Pewee	*Contopus virens*	S4B	G5	SC	SC		x
Great Crested Flycatcher	*Myiarchus crinitus*	S4B	G5				
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5				
Blue Jay	*Cyanocitta cristata*	S5	G5				
Barn Swallow	*Hirundo rustica*	S4B	G5	THR	THR		x
Black-capped Chickadee	*Poecile atricapillus*	S5	G5				
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5			10	
House Wren	*Troglodytes aedon*	S5B	G5				
American Robin	*Turdus migratorius*	S5B	G5				
European Starling	*Sturnus vulgaris*	SNA	G5				
American Goldfinch	*Spinus tristis*	S5B	G5				
Chipping Sparrow	*Spizella passerina*	S5B	G5				
Song Sparrow	*Melospiza melodia*	S5B	G5				
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5				
Common Grackle	*Quiscalus quiscula*	S5B	G5				
Northern Cardinal	*Cardinalis cardinalis*	S5	G5				
Indigo Bunting	*Passerina cyanea*	S4B	G5				
MAMMALS							
Eastern Cottontail	*Sylvilagus floridanus*	S5	G5				
Grey Squirrel	*Sciurus carolinensis*	S5	G5				
Red Squirrel	*Tamiasciurus hudsonicus*	S5	G5				
Red Fox	*Vulpes vulpes*	S5	G5				
White-tailed Deer	*Odocoileus virginianus*	S5	G5				

APPENDIX J
BUTTERNUT HYBRIDITY TESTING RESULTS

Ontario

FRMS-PL-F-003

LABORATORY TEST REPORT

BUTTERNUT HYBRIDITY TEST

OFRILS

1235 Queen Street East
Sault Ste. Marie, Ontario P6A 2E5
Phone: 705 946 7448
Fax: 705 946 2030

Report Date: 2019-07-17

Report ID: OFRILS-PL- 1939

Client	Stantec Consulting		
Address	200-835 Paramount Drive Stoney Creek, Ontario L8J 0B4		
Contact	Sean Spisani		
Phone:	(905) 381-3223	Fax:	
E-mail:	Sean.Spisani@Stantec.com		

MECP Contact	Species At Risk		
Address			
Phone:		Fax:	
E-mail:	SAROntario.ca		

Sample Received On: 2019-07-09

Method: Molecular tests to detect butternut x Japanese walnut hybrids*

Test Report:

Three standard molecular tests were conducted on one sample from 1260 Gordon St., Guelph, Ontario. Hybridity was not detected in the results of laboratory tests. To the best of our knowledge the sample represents butternut, Juglans cinerea. Sample details may be found on page two of this report.

Please direct any questions to the contact below.

This result and test report relates only to the items tested.

All appropriate laboratory quality controls were applied in producing the result/s. The results and interpretation are reported to the best of the knowledge and expertise of the lab and is based on the reference method adopted.

Laboratory Contact:
Glenna Halicki Hayden
Forest Pathology Lab Supervisor
Ontario Forest Research Institute
1235 Queen Street East
Sault Ste. Marie, ON P6A 2E5
Phone: 705 946 7412 Fax: 705 946 2030
Email: glenna.halickihayden@ontario.ca
Web: http://ontario.ca/ofri

Authorized Signature glenna.halickihayden@ontario.ca Digitally signed by glenna.halickihayden@ontario.ca DN: cn=glenna.halickihayden@ontario.ca Date: 2019.07.17 11:51:35 -04'00'

Name

---

* Based on published reference method: Peng Zhao & Keith E. Woeste. 2011. DNA markers identify hybrids between butternut (*Juglans cinerea* L.) and Japanese walnut (*Juglans ailantifolia* Carr.). Tree Genetics & Genomes 7:511–533. DOI 10.1007/s11295-010-0352-4.

This report shall not be reproduced except in full, or altered without the written approval of the laboratory.

All errors and omissions are limited to the cost of the analysis

FRMS-PL-F-003

SAMPLE INFORMATION AND TEST SUMMARY

OFRILS

1235 Queen Street East
Sault Ste. Marie, Ontario P6A 2E5
Phone: 705 946 7448
Fax: 705 946 2030

Report ID: OFRILS-PL- 1939

Lab ID	Sample Type	Tree ID	Collection Site	UTM Coordinates	LAB RESULT Hybridity Detected	
19091	Foliage	Bn Sample # 372	1260 Gordon St., Guelph, Ontario	17T 5645583 4818497	☒ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES
					☐ NO	☐ YES